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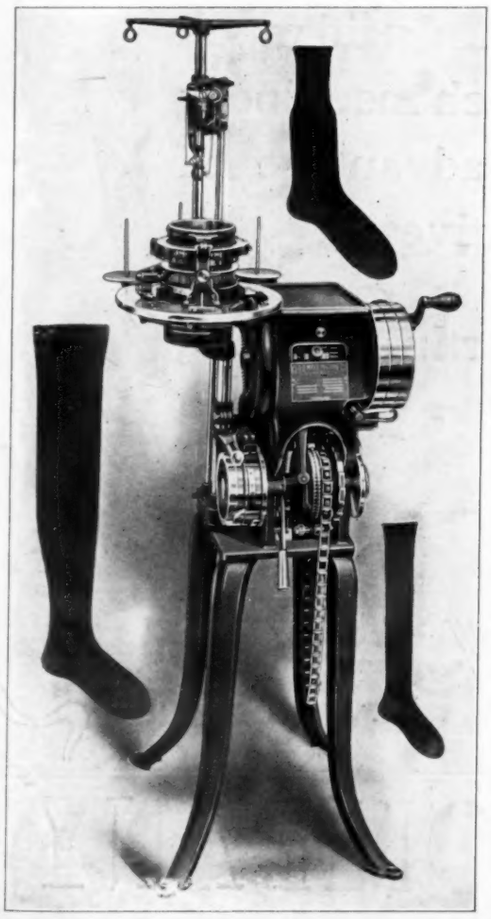

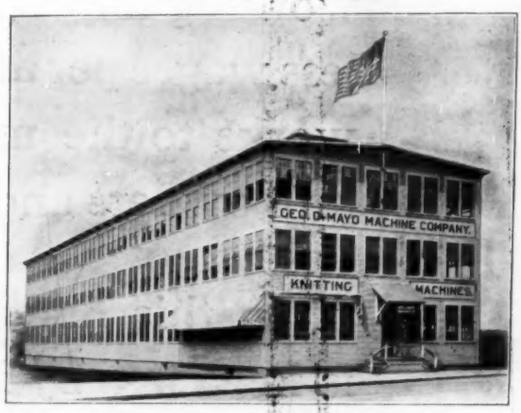

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THE INDIA COTTON EXPERIMENT.

The price of cotton continues to hold steadily around 15 cents, nothwithstanding the fact that a considerable amount of curtailment by some of the cotton mills, more particularly in the South, has already been put into effect.

In view of the fact that the prices of mill products have not been advanced materially since the price of the raw material has reached its present level, the position of the manufacturer is one calling for mature judgment and alacrity in devising plans for economies in production in all possible ways. The fact that the cotton itself is the preponderating expense of manufacture has been the cause of much thought in an effort to reduce that cost without sacrificing the quality of the product.

Upland American cotton is so admirably adapted for spinning medium counts that it is safe to say that no other class of cotton could be substituted for it with entire satisfaction. However, the opportunity to experiment with another class of cotton as a means of reducing the cost is not to be passed, and we are informed personally by Captain Ellison A. Smyth, of the Pelzer Mfg. Co., Pelzer, S. C., and H. C. Townsend of the Townsend Cotton Mill, Anderson, S. C., that experiments are to be made with India cotton in those and other mills in North Carolina and South Carolina as soon as the cotton now ordered arrives at the mills. The India crop this year is estimated at 6,000,000 bales; India cotton has been largely used in England for years in conjunction with American cotton, as well as in Japan.

Some 3,000 bales of India cotton have been purchased by Southern mills, but deliveries will not begin before February. Experiments will be made along two lines, namely, by mixing the India cotton with American cotton and processing, and by processing the India cotton alone. The price paid for the cotton already contracted for was around 11⅜ cents landed in America.

The experiments to be made by the two mills mentioned will be watched with interest, and the results will be of value to the industry, by showing what can and what can not be done with that staple. The Pelzer mill spins medium counts, while the Townsend mill spins lower numbers for single and ply yarns, and thus the experiments will cover the counts of yarns chiefly spun in the South.

There are a number of varieties of India cotton which may be divided into three general classes according to the source of the seed, namely, native cotton, varieties raised from American seed, and those grown from Sea Island and Egyptian seeds. As a rule, all of the varieties are of inferior quality, and the length of staple varies from three quarters to one inch. The most important of the different varieties are Hingunghat, Broach, Dollerah, Tenevelly and Dharwar. The fibers of all of these varieties, except Dollerah, are very strong, making them suitable for warp yarns, while Dollerah is rather weak and its use is confined to filling yarns. With Hingunghat cotton,

it is practicable to spin as high as 30's, and when mixed with American cotton, 40's can be spun. The other varieties mentioned are suitable for spinning counts from 20's to 3'0s.

One of the disadvantages to be encountered in the use of India cotton is the large amount of waste present in the form of dirt and other impurities. However, this is a minor difficulty, because of the thorough cleaning processes which are available in the mill.

The substitution of India cotton for or mixture of it with American cotton, if feasible in this section, is far preferable to a shut down of the mills or a wage reduction. If the contemplated experiments are successful, it will be means of relieving to a certain extent what is now a very serious problem with the mills. The great army of cotton mill operatives, whose very existence depends on constant employment should be kept at work, and all means exhausted to that end in keeping with business methods.

THE MINISTER TO CHINA.

The sudden summons of Minister Crane to Washington just previous to his expected departure from San Francisco to take up his new duties in the Orient, and his enforced resignation on account of an unfortunate newspaper interview, has caused a mild speculation as to his probable successor, and many suggestions of men for the position have been made.

Some expressions of skepticism of Mr. Crane's knowledge of the textile industry were heard after his appointment, and the general opinion was that this was a very important point to Southern cotton manufacturers who were making strenuous efforts to capture as much of the Chinese textile trade as possible. Their position is well taken in regard to having a representative who is thoroughly alive to conditions and who has a thorough knowledge of the textile industry, as the Chinese Empire is beginning to shake off the mantle of ancient ignorance, and to acquire some of the modern ideas of business and living that are already bearing fruit in a material way as shown by the enormous increase in exports from the United States during the last few years to the Empire. For this reason it is very essential to the best interests of our trade with China to have a minister from the United States who is especially qualified to stimulate and encourage this trade. It is astonishing to know how rapidly the exports of cotton goods to China are growing; the first nine months of the present showed that nearly $8,500,000 worth of cotton cloth had been sent to China compared with not quite $4,000,000 for a similar period of the previous year. Such expansion gives an idea of the vast possibilities that Southern mills have to find a ready market for their products. The completion of the Panama Canal will be the signal for the eyes of the world to turn toward China and at the same time give the Southern States a tremendous opportunity to press the sale of their products in that Empire. The United States should therefore be building up its trade relation in every possible way with that event in view.

D. A. Tompkins of Charlotte, N. C., who is known better than probably any other Southern man connected with the textile industry has been suggested as minister to China by a great many prominent textile men and by the American Cotton Manufacturers' Association and the National Association of Cotton Manufacturers, which is not only a great compliment to Mr. Tompkins, but shows the earnestness of the textile interests in building up American trade in China. Mr. Tompkins' ability and his intimate knowledge of the textile industry which has come through years of experience and close study, have combined to equip him most thoroughly for this high position.

He is well known in the North and South as a man of great executive ability, and has the distinctly fortunate disposition that always makes friends and never enemies. All of these qualifications would be of immense benefit in the performance of a minister's duties in China if Mr. Tompkins is appointed and is disposed to accept the appointment, which we think would be agreeable to him at this time, although when his name was mentioned previous to the appointment of Mr. Crane, he told his friends that he would not then accept the appointment.

We trust that the country may be fortunate enough to have Mr. Tompkins as its minister to China, and that the President will make such an eminently satisfactory appointment which will have the hearty endorsement of the entire textile industry in this country.

WAR ON THE HOOKWORM DISEASE.

Announcement was made recently of a commission of eminent men who were called together by John D. Rockefeller for the purpose of forming a permanent organization to wage war on the hookworm in the South. The commission was assured of substantial financial aid to the amount of $1,000,000 during the next five years by Mr. Rockefeller. Such a comprehensive and carefully considered plan for the extermination of this strength sapping disease which finds its most destructive effect in the rural districts of the South, will be of untold benefit to those people.

The hookworm is described as a hair-like parasite about one-half inch in length, that finds ready development in the sand districts of the South more than in clay districts and cities. When the hookworm gets into the human system, it lives in the small intestine, sucking the life blood of the victim and producing minute hemorrhages. The effect upon a diseased person is to sap his vitality, retard both his mental and physical growth, lower his efficiency and makes him more susceptible to other diseases. These symptoms have often been mistaken for results of malaria and other diseases, and have been regarded in some cases as sheer laziness and indolence. The fight that is now to be waged on the disease is of especial importance to Southern cotton mills, as they have drawn and are still drawing upon the farms for operatives to work in the mills, and it is to the interests of all concerned to have such operatives in the best possible condition, physically, mentally, and morally.

Dr. Charles W. Stiles, of the United States Public Health and Marine Hospital, has made an exhaustive study of the disease, and to him belongs the credit of making the discovery, which he announced in 1902. According to Dr. Stiles, 12½ per cent. of the employees in Southern cotton mills are affected with the disease. The malady, however, is brought to the mills by operatives who leave the small unsanitary farms to take up work in the mills, and it has been shown that the condition of the operatives is improved after coming to the mills due to

the highly sanitary conditions that are insisted upon by the authorities.

Careful and systematic research work has been the means of discovering methods for the prevention of the disease to a great extent and a simple remedy for its cure. With the efficient commission at work to eradicate the disease and with the generous fund to prosecute its endeavors, it seems only a short time when the scourge will be a thing of the past. The beneficial effects will not only be felt in the homes of the workers, but the manufacturing establishments will have the benefit of increased efficiency as well the moral effect of having the operatives who were previously diseased take more interest in their work. Southern cotton mill managements have always shown the deepest interest in the welfare of their operatives, both in the mill and in the home, by improving conditions, and the commission will find in its work a most hearty co-operation of the mill interests in the fight to eradicate the disease.

TEXTILE TRAINING.

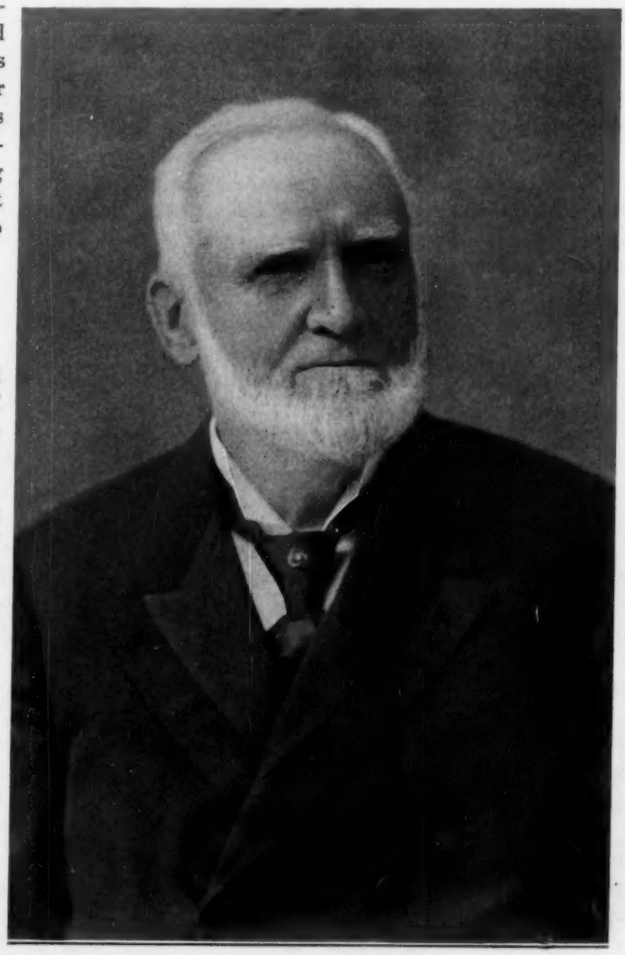
There appears in this issue an article on "Continental Textile Schools" by Prof. Wm. H. Dooley, principal of the Lawrence Industrial School, to which we desire to call especial attention, owing to the valuable information contained therein relative to textile training on the Continent. Prof. Dooley was delegated by the Massachusetts Commission on Industrial Education, and the City of Lawrence, Mass., to visit the leading textile schools of Europe and study industrial and educational conditions. The countries covered in the article are Germany, France, Belgium, Holland, and Switzerland.

It is plain to be seen from the article that a great deal of stress is laid on textile training in Europe, which accounts, in a great measure, for the degree of perfection which they have attained in the manufacture of textiles. One's attention will naturally be attracted by the fact that in most instances, the evening and Sunday classes are so much larger than the day classes, showing that textile workers themselves realize the great opportunities offered and are quick to take advantage of them. Being so closely associated with the practical end during the day, it is an easy matter for these students to grasp the subject theoretically. Further than this, in the ordinary course of events in a mill an overseer or under boss does not have an opportunity to study other departments, than his own, with the degree of care that will acquaint him thoroughly with it, so that this deficiency is made up at the school, both practically and theoretically. After such a course has been completed successfully a man is well fitted for a more responsible position in a mill.

Textile schools in this country could well afford to pattern their courses after some of the European schools, to the extent of providing evening courses for mill workers, and some of them have. Overseers and others could not spend their time for improvement to better advantage than by availing themselves of such an opportunity. Every successful man must acquire the requisite knowledge of the indutsry in some way, either by mastering it from books by himself or having the school to aid him, and the latter method is much easier and more satisfactory, as mistakes and misconceptions are more easily caught and rectified than are mistaken ideas that are absorbed from books, due to insufficient explanations.

JOSEPH B. BANCROFT.

Joseph B. Bancroft, president of The Draper Co., Hopedale, Mass., died on Monday morning, October 25, 1909. Mr. Bancroft was the last of the older generation connected with the Hopedale industries. He was born in Uxbridge, October 3, 1821, and was therefore, 88 years old, having passed a life of useful activity until within a few years, when he took his well-earned rest from active



THE LATE JOSEPH B. BANCROFT.

business. He was one of ten children of Samuel and Mary (Bubier) Bancroft. His father, who was born in Marblehead, in 1784, was taken prisoner by the British in the war of 1812 and confined in the infamous Dartmoor Prison.

Joseph Bubier Bancroft married Sylvia Willard Thwing, daughter of Benjamin and Anna (Mowry) Thwing, in 1844 and from this union there were ten children, of which there are five surviving. They are Eben D. Bancroft, a prominent official of the Draper Co., Hopedale, Mass., Anna M., unmarried, who since her mother's death several years ago has presided over her father's household; Mary Gertrude, wife of Walter P. Winsor, of Fairhaven, Mass., president of the First National Bank of New Bedford, and one of the trustees of H. H. Rogers estate; Lilla J., wife of H. W. Bracken of Hopedale, one of the Draper Co., superintendents, and Lura B., widow of Charles Day, who at the time of his death was general superintendent of the Draper Co.

MR. BANCROFT'S CITIZENSHIP.

Before the division of the town of Hopedale from Milford, Mr. Bancroft was one of Milford's valued citizens and was honored with the office of selectman, in 1877-8-9. He represented the town in the State legislature in 1864, and was one of the engineers of the fire department from 1875 to 1881, inclusive. In all official connections with public affairs he was thoroughly respected and trusted, as well as esteemed for his ability and careful work in the interests of the town.

He was for ten years one of the directors of the Home National Bank, resigning last January. He was also for many years on the management of the Milford Gas Light Co. and resigned as president, May 26, 1909, on account of his failing health. He was a member of Montgomery Lodge A. F. & A. M., of Milford, taking his degrees in 1868, of Lebanon R. A. Chapter in which he took his degrees in 1869, and of Milford Commandery in which he was knighted in February, 1869. In all of these orders he was an honorary life member, voted to him for special favors he had rendered to the lodge, chapter and commandery. In his death it breaks three generations, belonging to these orders, as his son and grandson are members of the same bodies.

Mr. Bancroft was liberal with his means and to this fact is due the fine public library which he erected a few years ago and presented to the town of Hopedale, as a memorial to his deceased wife. Other benefactions of his in generous amounts are known to a few but of such a nature as not to be used. Mr. Bancroft was essentially a man of the people. Coming from the ranks, an honest workman himself, he knew of the needs and trials of the ordinary workman, and as one of the heads of the large company with which he had been associated for more than half a century, he was always well thought of by the help.

At a meeting of the directors of the Draper Co., held November 1, the following report was made by the committee appointed October 25, said report being unanimously accepted and vote passed as recommended:

"Joseph B. Bancroft, our president and loved fellow member, died Monday morning last. Your committee appointed to prepare a fitting record of his service, presents its report. Before the formation of the Draper Company, Joseph B. Bancroft was intimately associated with the other founders of the business taken over, and was an honored and trusted associate. On the formation of the company he was elected a director and vice-president, which office he held continuously for some years, when he was elected president of the company which position he held when he died. He was a wise counselor, an able, fearless and loyal friend and an efficient administrator; and his associates feel deeply their loss. We move that the above testimonial to his worth be inscribed on the records of the company, and that copies be sent to his family and to the local press."

OBITUARY.

John F. Knowles, treasurer of the Acushnet Mill Corporation and Hathaway Mills, New Bedford, Mass., died suddenly on November 8th, at the age of 56 years.

Mr. Knowles received his training when a young man under M. C. D. Borden, and it was very thorough. This association gave him a broad and intimate knowledge of the textile business and enabled him later to accept and fill important positions in the textile field. As treasurer of the Acushnet Mill Corporation and the Hathaway Mills he made a remarkable record and was regarded as one of the most successful mill men in New Bedford. He was made chairman of the executive committee of the New England Cotton Yarn Co. when that concern was organized, and was also a director in the Union and Pocasset Mills and the Mt. Hope Finishing Co. He is survived by a daughter and two sons.

THE CURTAILMENT SITUATION.

The efforts of several of the textile associations of the country to inaugurate a systematic plan of curtailment in the cotton mills, as a means of relieving the very unsatisfactory state of affairs in the industry owing to the disparity in the prices of raw material and finished product, have been very successful. A large proportion of the cotton spindles of the country are now on some special schedule of curtailment, varying from two hours a week in some mills to two days a week in others.

The New England mills as a rule are curtailing two hours a week, by cutting off 20 minutes from the working time every day. Those mills that are thus curtailing are working 56 hours a week. The 56-hour law in Massachusetts, which goes into effect on Jan. 1, 1910, has caused many of the New Bedford mills to curtail at the present time to that extent.

The majority of the Southern mills that are curtailing have either closed down indefinitely or are curtailing one day a week. At a recent meeting of the Georgia Industrial Association, it was decided that all of the mills in the association would curtail production to the extent of 25 per cent.

Among the New England mills reported to be curtailing two hours a week are: Appleton, Lawrence, Boott, Merrimac, Massachusetts, Hamilton, and Tremont and Suffolk in Lowell, Mass.; Wamsutta, Potomska, Pierce, Soule, Taber, Grinnell, Hathaway, Acushnet, Bristol, Butler, Dartmouth and Gosnold in New Bedford, Mass.; Lancaster Mills, Clinton, Mass.; Otis Co., Ware, Mass.; Parkhill Mfg. Co., Fitchburg, Mass.; Thorndike Co., Thorndike, Mass., and Pacific Mills, Lawrence, Mass.

Among the Southern mills curtailing one day a week are: Richland, Palmetto, Granby and Olympia, Columbia, S. C.; Watts Mills, Laurens, S. C.; Middleburg Mills, Batesburg, S. C.; Lexington (S. C.) Mills; mill in Saxagotha County; Erwin Mills in Durham, Duke and Cooleemee, N. C.; mills at Union and Greenville, S. C.

In Alamance County, N. C., 26 mills will curtail 2 days a week until February. The Everett and Pemberton Mills, Lawrence, Mass. and Methuen, Mass., will cut off two hours a day until January. Patterson Mills, China Grove, N. C., will stop three days a week. The Consolidated Duck Corporation of Baltimore, Md. are also running on a special schedule.

SPECIAL DESIGN.

The special photographic design of the officers and board of governors of the Southern Textile Association which appeared in the November issue was made from photographs for which we were indebted to the "Textile Manufacturer," Charlotte, N. C.

Continental Textile Schools.

TEXTILE SCHOOLS IN GERMANY. HIGHER SPECIAL TEXTILE SCHOOLS. SILK WEAVING SCHOOL IN SWITZERLAND. FRENCH TEXTILE SCHOOLS. BELGIUM TEXTILE SCHOOLS. HOLLAND.

(*Contributed exclusively to* COTTON.)

BY WILLIAM H. DOOLEY, principal Lawrence Industrial School.

In the days of homespun clothes, when the science of their making was the science of the home, it was necessary for the maker to know practically every branch of the textile industry. The textile schools at that time in order to meet this need taught practically every branch of the textile industry in one department; spinning, weaving, dyeing, finishing, embroidering, lace making, etc., all came in for their share of instruction under one teacher and in one room.

But when new conditions of industrial life appeared with the changing over to automatic machines from the hand processes, the methods of the textile schools were changed to meet the new industrial educational needs. The hand loom was replaced by the mechanical loom, and the little dye tub was abandoned for immense vats in large brick structures. Especially within the last generation have numerous inventions, new processes of manufacture rapidly crowding upon one another, created such complexity in all branches of the textile industry that no one school can hope to teach the textile trade in a few courses. It is necessary to learn one thing and learn it well. Specialization is the keynote of success. In harmony with this demand, European textile schools are rapidly specializing their courses and greatly adding to the efficiency of their instructions.

There is one important point that is often overlooked in comparing the American and European textile schools and that is the difference in the organization of the textile industries in the two countries. In Europe all operations of wool washing, carding and spinning, weaving, dyeing and finishing are conducted in separate establishments. The manager of a weaving mill frequently knows little if anything of a spinning mill and vice versa. The same applies to the manager of a dye house. As a result of this organization the manager of each establishment develops into a more competent man in his specific vocation than one who is burdened with the superintendency of all the numerous and complicated processes involved in the converting of raw cotton into finished cloth or raw wool into finished cloth, as is the case of a mill agent in the United States who has charge of all these operations. Mill men of Europe claim that there is another advantage in the separation of these operations. A huge spinning mill is as a rule, laid out to make counts of a limited range and they seldom change. This practice makes it possible to have a greater production per spindle of a better quality and at a lower cost per pound than in larger mills where all the operations of manufacturing are performed, as is the case in this country.

There are few if any of the factory industries in which a greater and more successful application of technical school training has been made than in the textile trade. In this industry Germany is the pioneer, and its schools hold high rank. (Of course all European textile schools meet the needs of the local industries, and since the organization of the industries are different than in this country, the schools are correspondingly different). Germany spends more money on textile education than any other country. The importance of the textile schools can not be too highly estimated. They are the main pillar by which the German textile industry maintains its competitive power in the foreign market. Cheapness of labor is not sufficient to attain this end; cheap hands must be taught, and taught well, or their work in the end costs more than that of more expensive hands who possess high skill and a thorough understanding of their trade.

In 1896, a reorganization of the textile schools was made by the German government which has had a very important influence upon German textile education. The schools were divided broadly into two classes: (1) Higher special textile schools intended for the training of the skilled manager, director, and supervisor and (2) Special textile schools intended to produce the skilled artisans and foremen. The aim of each textile school was more clearly defined than it had been previously. Instead of being a hodge-podge, the course of study was constructed so as to confine instruction to that branch of the textile industry which existed in that locality.

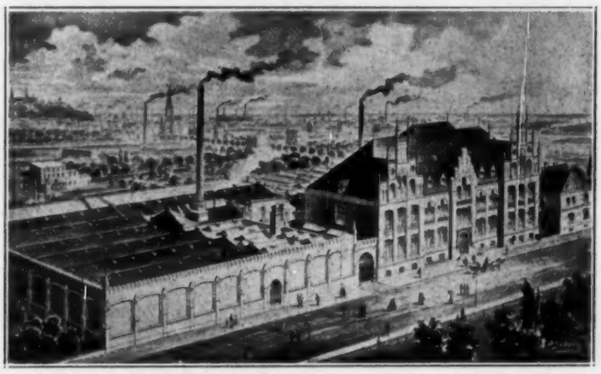


FIG. 1. GENERAL VIEW OF THE TEXTILE SCHOOL AT MUNCHEN-GLADBACH, GERMANY.

In 1901, the "Institute for the Equipment of Textile Schools" in Berlin was changed into the "Central Technical Bureau for the Textile Industries" the object of which is to superintend and to assist in the equipment of textile schools; to advise the Prussian Minister of Commerce and Industry on matters relating to textile education and the industries; to undertake tours of inspection; to formulate courses of study, syllabuses, and examination; and to conduct mechanical and chemical experiments in textile technology. The textile schools in Prussia are directly under the control of the Central Bureau, but the schools in other German states are more independent. In order to visit the Prussian textile school it was necessary for the writer to obtain permission from the bureau in Berlin.

The financial assistance given by the German government in textile education has enabled enormous progress to be made. Old models, charts, machinery, drawings, and the numerous other essentials necessary for efficient in-

struction were replaced, improved and new ones introduced. All these schools have large staffs of lecturers and assistants; they have ample accommodation for lectures and class work in textile and allied subjects; machinery and apparatus which are kept in a high state of efficiency; schools are furnished with good libraries and reading rooms with the current textile publications; the fees are moderate, the usual annual charge being $50 for a day course of 44 hours per week. There are a large number of day students in attendance, although the entrance requirements are severe. The fees charged to foreigners are enormous, being usually five times the amount charged to German students. The fees for evening and Sunday morning classes of 16 hours per week are from $4 to $8 annually. In completing a day course, students who give satisfaction

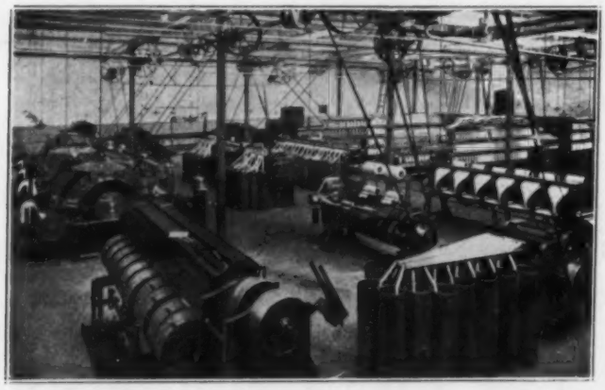


FIG. 2. CARD ROOM. TEXTILE SCHOOL AT MUNCHEN-GLADBACH, GERMANY.

at the final examination receive a diploma; those who fail or who do not complete the full course obtain a certificate stating the classes taken and the length of time they have attended.

The products of the schools are nearly all sold and in many cases material is supplied by the trade in a raw or practically unmanufactured state to be worked up in the various departments. The actual conditions of factory are thus observed in the schools to as great a degree as possible; but while the sale of the production in a spinning department is almost unavoidable if large machines are to be employed to a reasonable extent, in weaving the student's experimental designing is greatly limited by practice. In several schools it was observed that hand looms are used for experimental work, but on the power looms the students are largely restricted to weaving standard styles. These schools are usually maintained by the government, municipal grants, the sale of materials, and fees.

BERLIN HIGHER SPECIAL TEXTILE SCHOOLS.

Berlin contains some notable manufacturing establishments. It is the chief pleasure town of Germany, and the great center for wealthy persons in search of amusement and dissipation. Consequently the old fashioned German virtues to which Germany owes its strength have little hold on Berlin. The textile school in Berlin is somewhat exceptional. The subjects taught are more numerous than usual and there are evening, as well as day classes, and Sunday courses. The subjects are designing, weaving, dyeing, knitting, lace and embroidery making, and the commercial and legal aspects of textile manufacturing. The day courses, which are for manufacturers, managers and experts, are for one or two years of forty-two weeks, forty-four hours to the week. The evening and Sunday courses, which are far more numerously attended, are for workmen, merchants, and trademen.

Considerable time is devoted to paper exercises. Pupils work hard and acquire a thorough theoretical grasp of the business. There are excellent museums and libraries. Museums are of great value in textile schools, particularly in relation to designing and dyeing. Spinning is not taught, but the department is well equipped with power and hand looms chiefly of German make. Wool is used to much greater extent than any other fiber. There are about 50 day, and 130 evening and Sunday students.

BARMEN HIGHER SPECIAL TEXTILE SCHOOL.

Barmen is noted for its variety of industries. This is an important factor in the maintenance of steady employment. Her textile school teaches weaving, manufacture of ribbons, braids and laces, dyeing and finishing, while calico printing is about to be introduced. There are 30 machines for making braids, 18 for sewing and embroidery, 34 ribbon looms, 24 heavy power looms and 23 hand looms. The weaving room is well lighted and exceptionally large (140x100 feet). A large proportion of the looms are fitted with Jacquards which are separately supported. Figure designing and color form an important part of the school work, and all designs are made and cards cut by the students. A large number of wooden models of loom motions were noted and also cases containing samples illustrating the processes through which the different fibers pass.

The dyeing and finishing department is very fully equipped and there are several large chemical and experimental laboratories. There is a balance room and a special room for testing dyestuffs as they are delivered. There are eight copper vats for silk and wool dyeing, and ten wooden vats for cotton dyeing; some of the vats being capable of holding over 100 pounds of material at one time. A mercerizing machine and a sulphur chamber were especially noted. There are 70 day and 270 evening and Sunday students. The day course is two years and the evening is three years.

CREFELD HIGHER WEAVING SCHOOL.

Crefeld is a curious place. It is purely a manufacturing place, but totally unlike any other that the writer has seen in Europe. In the first place there is no obvious reason why it should be the seat of manufactures at all. It is not near cool or running water or any such natural resource, nor is it on a great highway. It is a highly

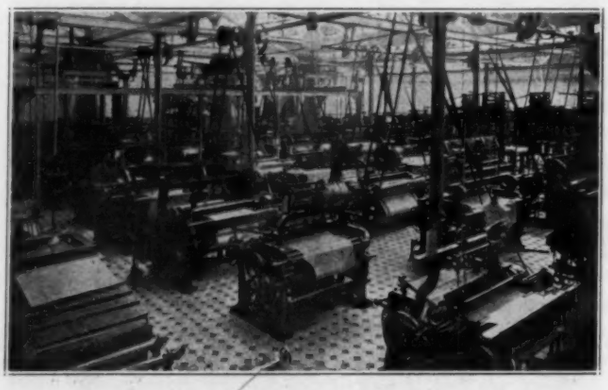


FIG. 3. WEAVE ROOM. TEXTILE SCHOOL AT MUNCHEN-GLADBACH, GERMANY.

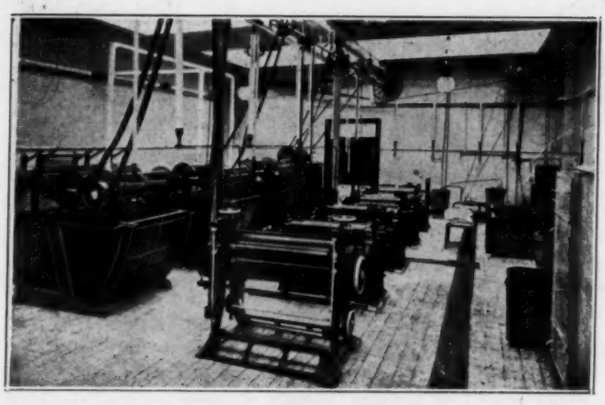


FIG. 4. DYE ROOM. TEXTILE SCHOOL AT MUNCHEN-GLADBACH, GERMANY.

attractive place; clean and tidy, with plenty of trees, gardens and open spaces. Yet Crefeld is as completely a mill town as Oldham, England is, and the mills are ranged on the fringe of the streets, numerous, modern, red brick, and business like. They are chiefly devoted to the manufacture of silks and velvets which form the great staple industry. The textile school contains departments for silk and velvet weaving, hand and machine embroidery, dressmaking and white sewing. The weave room contains one hundred and forty looms—one-half being hand looms. Most of the power looms are separately driven by motor. There are excellent preparing machinery and apparatus for cloth and yarn testing. There are 180 day, but no evening students.

The principal thing that appealed to the writer was the museum of textile fabrics which is in two parts. One part is a room in which modern styles are exhibited showing fine figured silks and velvets. Samples are being constantly changed and local manufacturers and designers have the privilege of studying fabrics on payment of small fee. The other part is the museum proper which is in two rooms, each being divided into sections and containing over 10,000 samples from the earliest periods to modern times. One side of the room is decorated with mural paintings illustrating different epochs in the textile industry. This museum at Crefeld is one of the best in Europe; in fact there is only one other which is approximately equal to it, and that is the Musco Archeologico, at Florence, Italy.

In the Crefeld school there are 8,000 pieces of fabrics. The collection is of extreme historic value, including fabrics thousands of years old, from the tombs of the Egyptians down to the fashionable designs of the present year. The collections of the fifteenth, sixteenth, and seventeenth centuries are especially complete, and there is also an oriental section with many fine examples. The curator of this museum has a fund at his disposal, and is allowed to purchase fabrics wherever he goes. Some of the specimens have cost as much as $50 each for a square foot of cloth. One side of the room is decorated with mural paintings illustrating different epochs in the textile industry.

CREFELD DYEING, FINISHING AND PRINTING SCHOOL.

This is a large separate institution opened in 1904. Independent instruction is given in chemistry. There are several large chemical and experimental dye laboratories. There is a complete plant for dyeing and finishing cotton, wool and silk. The workshops are top lighted. The work is done on a commercial scale, materials being obtained from manufacturers to whom it is returned after being dyed. The machinery is full sized and consists in part of three color printing machines, and a spraying machine for washing off hanks. There is a separate room for indigo dyeing. The library contains 3000 volumes. One of the features of the school is the large collection of dyestuffs. There are 65 day students and no evening students. The course is three years.

MUNCHEN-GLADBACH HIGHER SPECIAL TEXTILE SCHOOL.

The town Munchen-Gladbach has a double name to distinguish it from another Gladbach in the Rhine province, and is the center of the chief cotton manufacturing district in Prussia. Germany is not famous for this industry which is still in a comparatively early stage of development, and consequently the town is but little known to the world; but it has a particular interest for that reason. Here is to be seen a branch of manufacture in which Germany does not yet excel; and the manner of its cultivation and growth is worth noting.

In 1860 the population was about 17,000, it is now over 60,000, and the increase is due to cotton. There is no doubt that Germany means to go forward with this branch of textiles. This is shown with the erection of a new textile school in 1901 at a cost of $145,995. The building is illustrated in Fig. 1. This is the latest thing of its kind and surpasses most of the textile schools in the United States. It concentrates its energies upon the cotton processes and is divided into three separate sections, (1) spinning; (2) weaving; and (3) dyeing and finishing. The class rooms are housed in a handsome red brick building, and the practical installation adjoining is laid out as

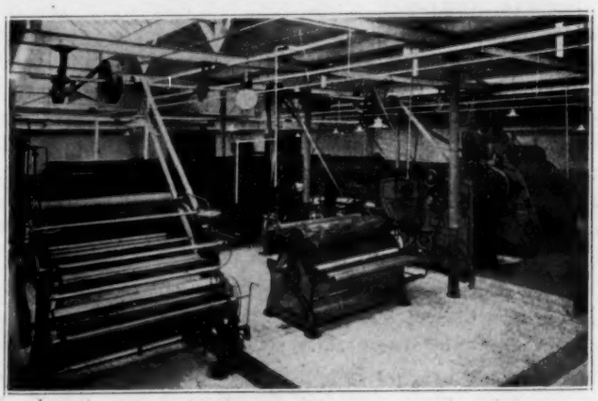


FIG. 5. FINISHING ROOM. TEXTILE SCHOOL AT MUNCHEN-GLADBACH, GERMANY.

a small mill, driven by a steam engine of 120 horse-power.

In the spinning section, courses of instruction are held for manufacturers, managers, and overseers. The course lasts one year, and consists of forty-two weeks of forty-four hours each. Sixteen hours out of the forty-four are devoted to practical work. Students must not be less than sixteen years of age, and must have a good grammar school education. It is preferred that they shall have had a year's previous experience in practical work. A good proportion of machines are of English make. The rooms are lighted by large arc lamps placed at equal distance apart near one side of the room with a shade over each lamp low down on the side near the wall. The light from these lamps is said to be better than daylight.

AIX LA CHAPELLE HIGHER SPECIAL TEXTILE SCHOOL.

The population of Aix la Chapelle or Aachen in Prus-

sia is about 136,000, and is not growing as fast as most of the other industrial centers. As regards manufactures, Aix is largely a woolen town; it spins, weaves, and dyes woolen and worsted goods, and it supports a textile school especially devoted to those branches of manufacture. The present school was built in 1888-1890. It is divided into four departments (1) weaving, (2) spinning, (3) finishing, (4) dyeing and aims like the Gladbach school, at providing practical experience on a commercial scale by manufacturing for the trade, and for which it has requisite installation. Its strong point is dyeing. The spinning outfit is also very complete. The weaving is done in the same room as the spinning. There is a small testing laboratory and a small museum. The museum contains cases of fibers and fancy yarns and printed diagrams of the fibers. A micro-photographic apparatus is used to a great extent and many excellent photographs of fibers showing the appearance before and after treatment by different substances. In dyeing there is an elastic bleaching apparatus and also a machine for dyeing wool under pressure.

In the finishing department there is an hydraulic cloth press heated by electricity, and a machine for dyeing cloth by suction. In the burling and mending department about 30 girls receive instruction and do excellent work. A new addition for evening school is being erected and when it is ready, all apprentices to textile work in the town will be compelled to attend.

CHEMNITZ HIGHER WEAVING SCHOOL.

Chemnitz is the most important manufacturing center in the district of Saxony in Germany. It is a clean, rather quiet place, not lacking in picturesqueness. It is often called the Manchester of Saxony, but Manchester has all the defects of a great city to an exceptional degree—the crowding, noise, vice and squalor. The factories are not hidden away in the background, but are everywhere and very much in the foreground. The city is the headquarters of cotton spinning. The cotton spinners and combers will not allow their dearest friends to visit their mills being afraid that they may take secrets away. The weaving industry in Chemnitz has gone through many vicissitudes and is not so important as it used to be.

The textile school teaches weaving only. The power looms are driven by separate electric motors. Textile design and color compose a very important part of the work, and although most of the looms are mounted with cotton yarn, great facilities for experimental design in setting dress fabrics, quilting, plushes, etc., are had. There is a good modern collection of textile fabrics, but in this school a special feature is made of exhibiting the different textile materials in the various stages of manufacture through which they pass; also of showing samples of loom details such as heald cords, reed wire, mails, shuttles, pickers, leathers, etc. There are 68 day and 138 evening students in the school.

REUTHUGEN HIGHER TEXTILE SCHOOL.

This school teaches cotton spinning, weaving, knitting, textile chemistry, bleaching, dyeing and finishing. A department is being added for the spinning of wool. In the cotton spinning department there are 59 different machines for the same purpose.

The bleaching, dyeing, finishing, and knitting departments are equally well equipped. There is an excellent textile testing laboratory. Cotton fabrics are dealt with principally. Microscopes of different powers with micrometer scales are used. There are 198 students of which 98 take weaving courses. There are no evening courses.

MULHAUSER SPINNING AND WEAVING SCHOOL AT MUCHEIM-AM-RHEIM.

This is a very old school and is decidedly out of date. Old and out-of-date looms are used; wool and cotton spinning, and weaving are taught. Instructions are also given in mechanics and motive power. There is a fairly complete equipment of preparing machinery. The tuition is the same for foreigners as natives, namely $200 the first, and $100 for the second year. The course is one year for spinning and one for weaving. There are 48 day students.

ZURICH SILK WEAVING SCHOOL IN SWITZERLAND.

This school is devoted to silk weaving and is the best in Switzerland. In addition to the above subjects, machine drawing, geometry, freehand and model drawing and color are taught. There is a full set of preparing machinery for preparing silk from the cocoon. The tuition fee for natives is $40 for first year, and $60 for second year; for foreigners it is $120 for the first year and $160 the second year.

FRENCH TEXTILE SCHOOLS.

The most prominent schools are at Lyons, Roubaix, Lille and Armentieres. The last three are national schools, and the instruction is given in other than textile subjects, while no fees are charged for either day or evening classes.

LYONS WEAVING SCHOOL.

Silk weaving and machine embroidery are the principal textile subjects taught. The school building is simply a tenement which has been modified for that purpose, and its external appearance and internal arrangement are inferior to those of any other school visited. The weaving equipment is similar, but not so complete as that of the Zurich school, and consists of 16 hand and 14 power looms which are distributed over the building four to six to a room with side lights. Many of the Jacquards are provided with five-sided cylinders and several combinations of harness and heddles were noted by which large repeats of figures are obtained in damask, plushes, etc. Of three types of mechanical swivel looms seen, one by a Lyons firm, was specially noted, which enables all-over figures to be obtained.

Two power looms, which are placed on stands in a separate room, are used for loom tuning, and a good feature which was not noticed in any other school, is the provision of a large board fixed to the wall in front of each loom. The board contains hooks and projections upon which the parts are suspended as they are taken off the loom. Saturday afternoon is reserved for special study and visits to factories; and for special lectures that are given on the last Saturday in each month. The day course is for one year and the fee for natives is $25; for foreigners $60. Evening and Sunday courses are for three years and the fee is $62 per annum.

THE ROUBAIX NATIONAL SCHOOL OF INDUSTRIAL ART.

Roubaix is like a vast hive. Manufacturing is the life of the place, and it is to the interest of those most prominent and active in affairs to furnish every facility to the rising generation to increase the prestige already acquired by the town in the production of high-class work of artistic design.

Roubaix boasts of a thoroughly well-equipped technical school founded in 1895 by private subscription. The school is divided into five sections, devoted to (1) spinning and weaving, (2) dyeing and finishing, (3) printing and industrial chemistry, (4) mechanics and electricity, and (5)

commerce. In the first four sections the art of production is taught; the fifth deals with the sale of articles produced. This school, in which instruction is free, is supplied with the most complete mill machinery of modern invention in every section, and technical instruction is accompanied by practical work. The machinery in the dyeing and finishing section is perhaps superior to that of any school in France. In October, 1897, night classes were opened for the purpose of affording operatives and overseers the opportunity of perfecting their knowledge, and of giving employers the opportunity to prepare themselves by a thorough study of mill bookkeeping and commercial correspondence.

Opportunity is also offered for the study of textile machines. A large garden with hot houses is conected with the school for the purpose of enabling flowers and plants to be studied and painted under natural conditions. There are galleries of pictures and statuary, and rooms with innumerable cases containing objects which are useful in suggesting ideas of form and color. The weaving department has 24 power looms and 26 hand looms which are in poor condition. The object of the school is not to produce skilled foremen, but expert designers. Works in the locality are open to inspection of the students to study the practical side of the application of the work they are engaged in. A feature of the school is the number of large diagrams, illustrations of cloth structures, and of textile mechanism. There is a large museum of textile fabrics which contains samples from earliest periods. Modern fabrics are classified according to the town of their origin. There are 1200 day and evening students of which there are 20 day and 240 evening students in the textile department.

LILLE INDUSTRIAL INSTITUTE.

The textile department is one of the four departments of the school. It was organized at the request of spinners and manufacturers of linen dress goods, and other products of the region. Pupils in this section have one hundred and sixty hours of practical work. For loom work they are sent under the care of a superintendent to the National Professional School of Armentieres, where work shops are of exceedingly high grade. The looms were being taken apart, and looked as if they were being studied for mechanism. The pupils must be at least 15 years in order to enter. The course is for three years, and there are 380 students attending the textile section.

ARMENTIERES NATIONAL PROFESSIONAL SCHOOL.

The aim of the school is to give apprenticeship training for boys and to prepare them for the positions of foremen and managers of industries. Compared to the textile school the students are younger and they are not so highly trained in mathematics and science appertaining to industries, but the workshop practice is similar, containing 18 hand looms mounted with various fabrics chiefly in cotton and linen, 14 power looms, and a number of preparing machines included in which is a slasher sizing machine. The power machines are used chiefly as models. The chief idea seems to be to keep the students abreast of the times as regards new mechanical devices. There is a splendidly equipped textile testing room; the testing is done by a man employed for that purpose. Standard samples of yarn in different materials and counts are kept for the purpose of comparison. Certificates of results are given. There are 420 students enrolled, 75 per cent. of whom board in the school. The course is four years and the tuition fee is $100 to $120.

BELGIUM.

VERVIERS HIGHER WEAVING SCHOOL.

Verviers has a large textile school for teaching woolen and worsted spinning, weaving, dyeing and finishing. There are 40 day and 400 evening students. The day course is four years, the first year being devoted entirely to the study of pure science and languages, and the second year to applied science. The third and fourth year students devote most of their time with textile work.

In the weaving department there are 25 hand looms mounted with particularly serviceable dobbies and Jacquards. Spinning is very complete and several machines are taken apart and used as models. The dye room is used simply for experimental work. An arrangement for testing dyed samples for fastness of the dyes to light was noted. It consists simply of a vertical wooden frame placed in front of a large window upon which the samples are fixed. A special class for girls in burling and mending is held on Sunday mornings. The fee for day classes is $50 for natives and $200 for foreigners. The evening classes are free.

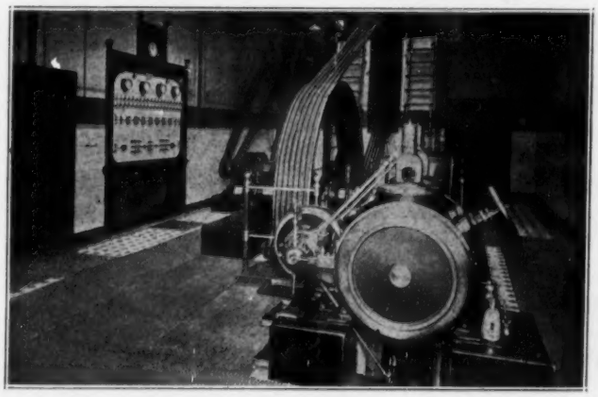


FIG. 6. GAS ENGINE AT TEXTILE SCHOOL, MUNCHEN-GLADBACH, GERMANY.

HOLLAND.

Enschede, in the province of Overyse'l, is the center of the cotton textile industry of the Netherlands and the home of the well known Enschede weaving school. The course for three years and consists of practical weaving, dyeing, bleaching, and related subjects. The school has an excellent equipment of instruments, machinery, models, engravings and charts. Evening classes are established for those who work days. The Enschede school has the honor of being the pioneer high school of the Netherlands. It was established in 1862 as a private enterprise and was deemed an educational experiment. The government has subsidized the school annually.

In all the above textile schools excellent facilities are offered for practical designing and excellent pattern weaving. Another point that impressed the writer was the complete finishing departments. Great stress is put on finishing processes and much is done to dress up the goods after they are woven. Excellent testing laboratories are found in most of the schools.

The efficiency of equipment of Continental textile schools greatly impressed the writer. In this respect the textile schools in this country are very much behind. Of course the expenditure of large sums of money for buildings and equipments does not mean that the efficiency of the teaching is correspondingly great. What we need in our schools are: (1) Different types of looms to serve as models; (2) great facilities for practical designing and experimental pattern

weaving. With evening students the time is too limited for them to become proficient. If we had simple types of power loom machines this objection would be removed and elementary students would do good work. We need well equipped testing departments and a library and museum. Continental schools are strong in preparing and finishing machines and particularly so in testing machines. Much drawing for textile machinery is also well provided for.

As in the United States the textile school courses (day) are used by the sons of manufacturers. The courses cover two, three and four years. The workers attend evening and Sunday classes.

MILL WORKERS.

The French, German, Swiss, Belgian and Holland mill operatives work sixty hours per week.

The mill operatives are an intelligent and active class. This is particularly so in Germany where business thoroughness is found, and accounts for a good deal of the Empire's success as a manufacturing nation, the military training and discipline at an early age, no doubt tending to make steady, obedient, and reliable workmen.

STRETCH IN COTTON GOODS DURING BLEACHING AND FINISHING.

SUIT OF THE KURSHEEDT APRON CO. VS. STANDARD BLEACHERY COMPANY DECIDED.

The bleaching and finishing industry of the United States has been much interested in the suit of the Kursheedt Apron Co., New York City, against the Standard Bleachery Co., of Carlton Hill, N. J., concerning the stretch or gain that takes place in cotton goods that are submitted to the operations of bleaching and finishing. The case has just been finally decided in favor of the Standard Bleachery. The Kursheedt Co. sued for the recovery of $20,000 damages for the alleged wrongful conversion of certain cotton goods turned over to the defendant company for bleaching.

This case has now been before the courts for three trials, in one of which the jury disagreed, and in the other two, verdicts for the defendants were given. It has been reported that the jury stood eleven to one in favor of the plaintiff at the second trial, the earlier vote having been seven to five in its favor.

The question of stretch in cotton goods during the bleaching and finishing process is one of great moment to the trade and the expert testimony that was introduced at this trial has attracted much attention. It is said that similar cases have been tried in England with the result that converters are legally prohibited from dealing in cloths.

The Kursheedt Co. is a converter and manufacturer of aprons, and, in this instance, bought its cloth through a broker and had it shipped direct from the mill to the bleachery, the manufacturer deciding the number of yards in each consignment. This description was accepted by the plaintiff and defendant. In handling the goods both parties relied upon the yardage stated by the manufacturer to be correct.

The plaintiff claimed that the process of bleaching or converting caused cotton goods to increase in length two per cent., and in substantiation of this it produced evidence showing that it does get a stretch from the goods it now has finished in other establishments, and made by the same mills that have usually made its fabrics.

The class of goods particularly involved in this case were lawns. Experts on this class of goods testified that there is from one to three per cent. stretch in bleaching and finishing, and one lot of goods were cited as showing that in the gray the goods counted 72 threads to the inch and in the finished state 68 threads, upon which was based the presumption of stretch in this specific cloth.

The Standard Bleachery Co., that is, the defendant, denied that cotton goods increase anything like two per cent. in the course of bleaching, or to any appreciable extent, and it further said that the more than three million yards of gray cotton received by it from the plaintiff for bleaching and finishing, increased only 1,446 yards by reason of these operations, all of which increase, it is claimed, was delivered to the plaintiff.

The defendants proved that they paid the plaintiff numerous bills for shortages and damaged goods, which goods thereby became their property to dispose of as their right. The defendants produced pieces of grey goods before processing, showing counted threads from two to seven picks less than what they should have been. They also proved by Doctor McKenna, a chemist expert, that after actually testing and following the same class of goods through every process in the bleachery's plant, there was no stretch in the goods. The defendants rested their case on the fact that even though Kursheedt may or may not have obtained stretch from other bleacheries, that fact in no way bound them to do the same; that they spent thousands of dollars on machinery to avoid strain on the goods so as to produce the best results on the finished article, and would under no condition guarantee stretch on goods finished at the grey width. The case was tried at Hackensack, N. J., before a struck jury drawn from a panel selected by Judge Parker. The trial lasted five days ending November 19th with a unanimous verdict for the defendants.

From a New England Bleacher and Finisher.

TRUST IS PUT IN THE HONESTY OF THE MILL FOR CORRECTNESS OF MEASURE IN THE GRAY. A DEFINITE PERCENTAGE OF THE INVOICED YARDAGE IS GUARANTEED. WHEN REMNANTS CAN BE KEPT BY THE FINISHER. FAULTY TESTIMONY OF EXPERTS.

BY A NEW ENGLAND BLEACHER.

The question of the stretch in goods that are finished is not a new one, and there are many converters who have the impression that the finisher gets a large amount of stretch that he makes no return of, and there are others who know that no such condition exists. Both of these classes, however, make either a written or an understood contract with the finisher to return a definite amount of goods or settle for the shortage. They are all aware that under no other conditions could they figure a definite price for their product. The unvarying understanding, therefore, whether written or not is for the return of a definite percentage of the gray yards, the finisher invariably assuming all risks as to correct measurement from the mill, and as to the amount of stretch due to the character of cloth or finish.

On goods shrunk in width, the agreed gain may vary from 1/2 per cent. up to 5 per cent. or more. On goods finished on gray width it is usually gray yards that are figured on, and on light fabrics or mercerized cloth only 95 to 99 per cent. will be promised by the finisher who knows his business.

Now if the finisher does not receive full yards from the mill; if the goods do not hold in length to the required amount from some peculiarity of finish, or if some accident destroys part of the cloth, the finisher pays for the yards short of the agreed amount at their gray value. This arrangement obtains, so far as I know, throughout the country and abroad, especially in England, and has been the custom, as can be proved by records for at least a century.

At present finishing prices, it is impossible for most finishers to measure accurately all gray goods sent them for converting, and the custom is, therefore, to examine for length a few pieces from each invoice, and trust to the general honesty of the mill that no intentional miscount of yards is made. From most mills such yardage will overage correct. Thus in the long run of finishing from a definite mill the average length will be about as invoiced.

The finisher must also be assured of the honesty of the converter with whom he deals as many mills will absolutely refuse to send to the finisher the gray length that has been invoiced to the converter, claiming that they are so instructed by the purchaser and refusing to verify the invoiced yardage of the converter.

So keenly has competition gauged the amount of the return to be expected on various lines of cloth that in the ordinary contract the finisher must be extremely careful that no serious accident befalls any piece of goods to enable him to return the amount agreed on.

This custom of guaranteeing a definite percentage of the invoiced yardage comes from the necessity of the converter knowing just what he may expect as the returned yardage to figure the cost of his goods in selling. If he can expect a gain of five per cent. he has a lower cost than with a loss of two per cent. If the return of the yardage is short of the guaranteed amount, the finisher pays the converter for the cloth so short, and in case goods are damaged they are taken for account of the finisher and treated as a loss from the gray yardage. Whatever is so damaged and paid for is sold by the finisher to the best advantage. Where from the pattern or peculiar construction of the cloth such goods if sold in the open market would interfere with the sale of regular goods, an arrangement is made with the converter whereby the goods are accepted with a definite allowance, but in ordinary plain cloth the finisher gets rid of his own mistakes.

On all goods finished on tenter frames there is necessarily a certain amount of cloth, averaging from 1/2 to 1 per cent. that is made unmerchantable by being wet and creased in handling, where the goods are wound up on shells in the various processes. These ends, in general practice, are cut from the pieces to make the balance merchantable. In extremely valuable goods a piece of cheap cloth is oftentimes sewed on to avoid this otherwise necessary loss. By long custom, and by reason of the cost of separating out such ends and putting each grade up separately, these remnants are taken by the finisher except in the case of special pattern goods as above. To attempt to separate and fold these short ends would, in the case of a large finishing works, take a lot of room and entail an expense for folding a single yard as much as the cost of folding a sixty yard piece. The custom of a century, has therefore made it entirely proper for the finisher to keep such, so-called, "remnants" unless under special contract to return them as mentioned above. When they are returned the converter pays in the cost of the work for such extra trouble, and in the case of ordinary goods the game would not be worth the candle.

It was pretty conclusively shown in the testimony of the so-called experts for the plainiff that they knew very little, if anything, as to the stretch in cloths in finishing. They began with stating that as the goods showed a loss in pick from the gray it was evident that the goods had been stretched. The value of such testimony is shown in the fact that in any piece of this class of cloth the variation may be from one to twenty per cent. in the gray, thus eliminating this test as a thing to depend on in figuring stretch. They also showed that they had sent cloth to the Standard Bleaching Co., and had received back more yards in the lawn finished than they had sent in the gray, but no attempt was made to show that the gray yards were as invoiced, and to take individual pieces in this way without verification is leaning on a broken stick.

In fact, the testimony of these experts was of practically no value in getting at the truth. Their expertness consisted in getting by, when qualifying as experts. I doubt if it is known, even in the finishing trade, by very many just where any goods stretch in the process of finishing. It is known that certain goods will stretch, when shrunk, one per cent., and upwards, and the testimony of the finishers, and the questions of the lawyers, seemed to indicate a belief that such stretch is largely obtained in the bleaching process. That this is not so may be shown by proper experiment. By far the larger portion of the stretch in such goods is obtained in later processes, to which goods of the finish in question are not subjected, or in operations whose effect is annulled by the subsequent process of tenter framing.

I have stated above the conditions that obtained in the dealings between the plaintiff and defendant. The Standard Bleaching Co., although no mention is made of the fact, in a written contract, agreed under the custom to return gray yards—the ordinary arrangement on 40 inch lawn of this character. They ran one lot into another, as is also customary, and so returned gray yards for a while. At certain times they found themselves running short on account of damages and they closed certain lots short and paid for the goods damaged, taking them as customary to their own account. These goods they sold and from these goods the trouble arose.

The Kursheedt Company found that some of these goods were being made into aprons which they claimed competed with their own product, but as the goods were ordinary staple plain goods the contention that they were thus materially damaged is reduced to an absurdity. Their contention that the presence of these goods in the hands of a dealer in Boston proved that the Standard Bleaching Co. was gaining many yards more than they returned, and was stealing their cloth, is absolutely without justification in view of the custom that I have stated.

The proof on which the plaintiff seemed to rely most upon in its effect on the jury, was the testimony of certain discharged employees, whose animus can be easily guessed, that the room where damaged goods and remnants were kept was known as the "gold mine." Such testimony is

utterly incompetent and its effect on the jury was undoubtedly such as to bias some of them. Such operatives had no knowledge of what part of these goods had been paid for by the bleachery, and they were in the employ of a rival concern whose object seems to have been to inflict as much injury as possible on the reputation of the defendant.

In connection with this case, and as a convincing argument that there is little stretch left in gray goods to-day, when received by the finisher, it was shown in a hearing of this case in Fall River, from the testimony of the agents and treasurers of various mills, that it is the custom to-day in most mills to run gray goods through trimmers or brushers or inspecting machines, the tendency of which is to stretch the gray cloth from three to five per cent., and thereby to take all chance of any further stretch from the converter.

REINFORCED CONCRETE CONSTRUCTION.

ITS ADVANTAGES. DISCUSSION IN DETAIL OF COST. FIREPROOF QUALITY. RAPIDITY OF CONSTRUCTION. EFFECT ON PRODUCTION. INCREASED LIGHT IN MILLS, AND LOW INSURANCE RATE.

(*Contributed exclusively to* COTTON.)

BY FRED S. HINDS.

Man in the stone age had little about his home to burn down. On this continent, in the days when Yucatan was at its full civilization, her public buildings and temples are now supposed to have been constructed in concrete. Our primeval forests of later discovery and with the abundance of brick clay have combined in the building up of our civilization in wood and brick construction which are far from being fireproof. From an early period there has been a striving after some material of construction

FIG. 1. VIEW SHOWING FIREPROOF VALUE OF CONCRETE CONSTRUCTION.

that would give the same conditions as the man in the stone age enjoyed in the security of his stone houses and temples. Concrete was known and used in the days of the Egyptians; the Pyramids have now been found to be of concrete. The Romans constructed the dome of the Pantheon in concrete. An Indian mosque at Lucknow was built of solid concrete 122 years ago. The largest room is 162 feet long, 54 feet wide and 53 feet high, without columns. This has no steel reinforcement and is still unimpaired.

Reinforced concrete was discovered by M. Monier about the year 1860; he was trying to make some large flower pots of concrete and to increase the strength he used as a frame, a wire mesh, and moulded the pot to this frame. The great increase in the strength of the pots brought to the attention of the Frenchman the possibilities of constructing walls, columns, beams, and floors in steel and concrete. Thus reinforced concrete is known and used to-day extensively in France, England, Germany and latterly in this country, commencing in California and moving east until now it is becoming popular in our Atlantic Coast cities.

The nineteenth century saw the dawn of the steel age, and the dawn of the twentieth century found us just beginning to use reinforced concrete as a fireproof building material. At this early period of the century the coming concrete age is foreshadowed, when man shall not know the horrors and financial loss of destructive fires and conflagrations. To-day all through the West can be seen buildings of all kinds, from the heavily loaded warehouse to a fifteen-story office building, constructed of this fireproof material. For factories it has become most popular in the middle West and middle Atlantic States. The cities of New York, Philadelphia and Baltimore have office buildings, factories and bridges in concrete throughout. It now awaits the textile manufacturers to make its use possible in the cotton mills and other textile mills.

At the conference of governors at the White House last spring, Andrew Carnegie in the course of a lengthy address on the waste of natural resources now taking place, spoke in part as follows:

"Fortunately the use of concrete, simple and reinforced, is already reducing the consumption of structural steel. The materials for cement and concrete abound in every part of the country; and while the arts of making and using them are still in their infancy, the products promise to become superior to steel and stone in strength, durability, convenience, economy and use."

REINFORCED CONCRETE FOR TEXTILE MILL CONSTRUCTION.

The following are fourteen leading advantages claimed in favor of this construction for cotton and other textile mills.

1. Its low cost and economy of construction, durability and maintenance considered.
2. Absolutely fireproof construction, as proved in recent fires.
3. Rapidity of construction, there being no structural materials to cause delay.
4. Less waste and greater production of goods, resulting from steady running machinery and better light.
5. The largest percentage of increase in window light for wide mills.
6. Lowest rate of insurance on buildings and contents by factory mutuals and stock companies.
7. Heat resisting qualities; thus cooler in summer, and lends to results desired by moistening apparatus.
8. Sanitary and vermin-proof; waterproof floors.
9. Becomes stronger with age and maintenance cost is practically eliminated.
10. Resists to a high degree the vibration of high speed machinery and vibrating looms.

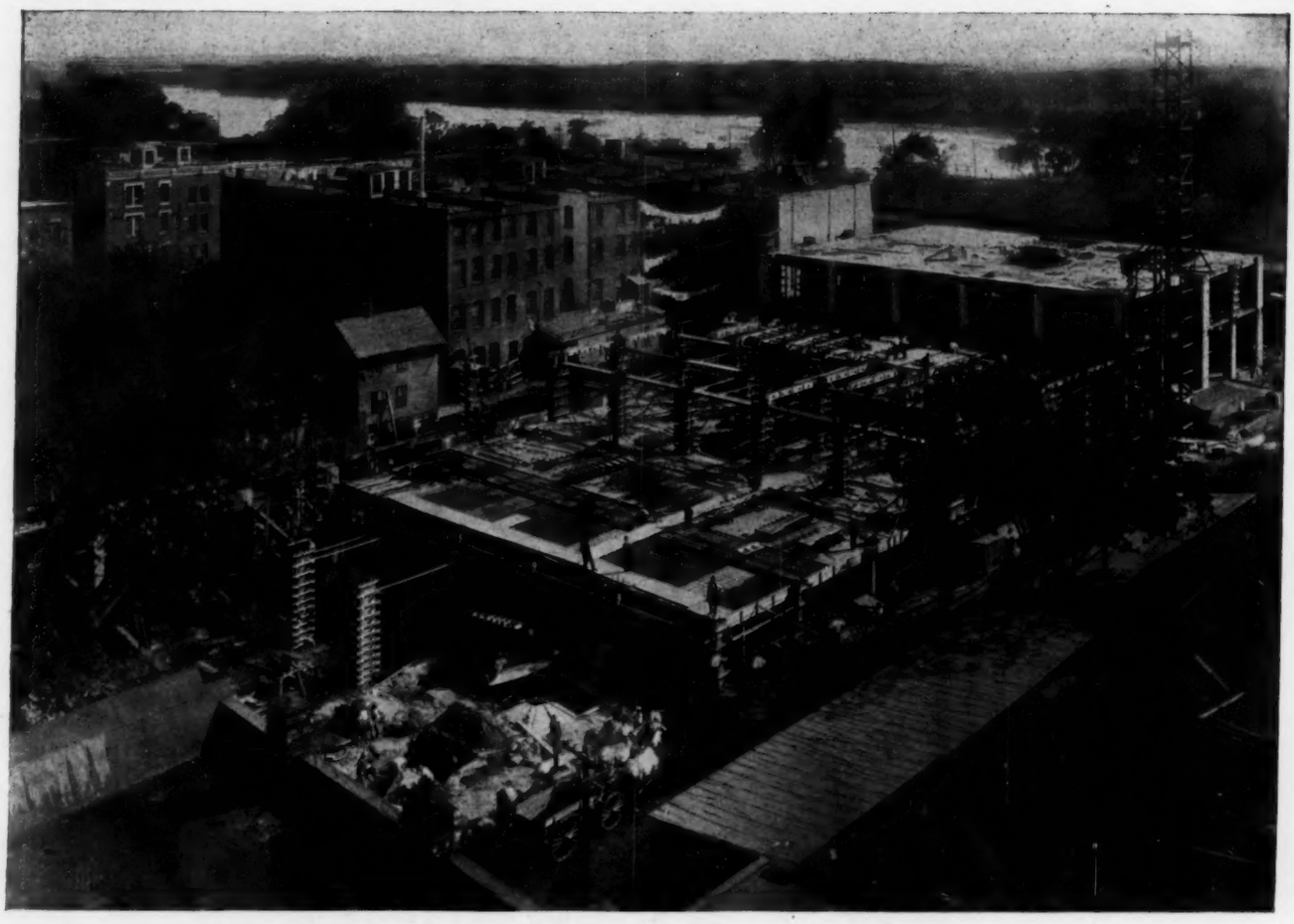


FIG. 2. VIEW OF CONCRETE BUILDING UNDER CONSTRUCTION.

11. Prolongs the life of machinery, and reduces the cost of repairs (particularly for looms), as it eliminates the "wear and tear" usually resulting from vibration of plank floors and the deflection of floor beams.

12. Tornado and earthquake proof. (A tornado in the South blew off the whole top story of a large brick mill, filled with machinery).

13. Saving in power; level floors throughout, there being very slight deflection in beams or slabs; all troubles from poor alignment of machinery and shafting are thus eliminated.

14. The strength and rigidity of this construction easily supports the light load of textile machinery.

To take up these fourteen advantages more in detail:

FIRST: The cost of concrete has been considerably reduced since the late Edward Atkinson, president of the Boston Factory Mutual Fire Insurance Co., made his comparison a number of years ago of the cost of mill construction versus reinforced concrete construction, which he found was about fifteen per cent. above the cost of mill construction for concrete. However, to-day, with more experience, both in the study and practical application of this material by a large range of scientific men, contractors and engineers, the method of construction has reduced this difference in cost of construction to a very small per cent.

The low cost that is possible will be demonstrated in the large cotton mills now being designed by the writer and to be erected in the South and West during the next eight months. One is a 50,000 spindle mill to be built in the South, and the other is a lace mill to be built at Lawton, Oklahoma. These mills will be duly described and illustrated in this series of articles on reinforced concrete, as the mills progress in their construction.

SECOND: That this construction is absolutely fireproof has been proved in recent fires and conflagrations. Take for example the Dayton Motor Car Co., the old and new building, the old building being of brick and wood construction, and the new building of reinforced concrete construction.

The illustration Fig. 1 shows the most remarkable and complete fire test to which reinforced concrete has ever been subjected. The fire started on the fourth floor of the reinforced concrete building and burned itself out without spreading to the floors above or below. It will be noticed how the fire finally spread to the adjoining older building of brick and wood construction, completely destroying two floors and the roof in spite of the fire department's strenuous efforts to extinguish it. The results of this fire prove conclusively that reinforced concrete is fireproof.

THIRD: The rapidity of construction gives it a high financial value in completing the building earlier than any other type of construction. There is no delay contingent upon slow delivery of materials, such as hard pine timbers, which on large orders of 16-inch timbers, are in the tree when ordered. We learned of a plant recently where the roofs of a plant were delayed 30 days waiting for rafters.

When working with concrete, it is a common thing,

after the foundations are completed, to run up a story every ten working days, using the same concrete forms over and over as the structure rises on the foundations. Work can be commenced promptly; cement, sand, broken stone, form lumber and steel bars can be secured on short notice. The steel reinforcing bars are shipped straight, in most cases, and then bent to the desired shape at the building. It usually takes six months to build an average sized four-story cotton mill and have it ready for the machinery. A mill in concrete can be built and made ready for machinery in five months.

FIG. 3. CONCRETE BUILDING SHOWING LARGE WINDOW AREA.

As an example, a factory in Brooklyn, N. Y., was built in just four months. This factory was very similar to mill construction. The size of this building was 75x600 feet and six stories high.

The publishing building, illustrated in its constructive state in Fig. 2 and in a completed state in Fig. 3 had five stories of the concrete frame, slabs and beams, run up in thirty-one working days by the using of two sets of wood forms. Fig. 2 is unique in that it shows so clearly the several stages of construction. Beginning at the lower left-hand corner, and examining the picture in detail toward the upper right hand, we have successively: Excavation prepared for column footings; column footings in place, both before and after the removal of the forms; basement column forms in position; first floor girders, beams and floor slab in position; first story column forms separate, also with girder forms alone, others with girders and beam forms, still others with the floor slab panels; lastly, the second story columns with finished third floor.

Portland cement is used entirely and having quick setting qualities is the paramount reason for the speed in concrete construction.

FOURTH: The subject of waste and greater production of goods is a constant study by the manufacturer. The management of all textile mills is ambitious to decrease the waste, both of stock and mechanical equipment, and to increase the production of goods. This can be accomplished both ways with a greater steadiness in the running of the machinery and power. This is possible as can be readily perceived from the fact that with rigid and smooth level floors the machinery will run more steadily than if set upon plank floors and deflected wood beams.

The writer when inspecting some English cotton mills, visited a saw-tooth weave shed with looms standing on flag stone. Being struck with the high speed of the looms they were at once counted and found them running 224 pick per minute. These were 36-inch and 40-inch looms. It has often been asked how the Englishman makes such good yarn out of poorer cotton than in America. Is the question not partly answered when it is understood that all their mills are fireproof, some with concrete floors and granolithic portland cement top, and some have smooth flag stone laid on brick arches?

A small weave room in this country was moved from a mill constructed building with plank floors into a concrete building and the manager was able to increase the speed of the looms to a much higher figure than was ever possible under the old conditions.

FIFTH: The illustrated design Fig. 3 shows the largest percentage of increase in window light for wide mills. The windows are 80 per cent. of the wall area and are 17 feet wide, and piers or pilasters 3 feet wide for the 20-foot bays. A 10-foot bay mill would give a window 8½ feet wide and pilaster only 18 inches wide.

Thus we have practically the same proportion as the common steel frame construction encased in masonry. The use of square head windows and sash, with the head or lintel practically on a line with the floor slab above, gives the maximum height of windows, thus increasing the high area for lighting into the center of a wide mill, over that of the common brick arches. The modern method of designing all kinds of buildings with increased window light area and particularly for manufacturing plants is therefore greatly augmented by this kind of construction. The outside walls consist essentially of glass between concrete columns, the window lintels as connecting beams at each floor level and much thinner than the columns. These same beams form the window sills, but are not formed until after the columns are up three or more stories.

SIXTH: The lowest rate of insurance can now be secured on concrete buildings and contents from the factory mutuals and stock companies, as these companies appreciate the value of fireproof buildings for housing the ever increasing value of machinery and stocks in process. However, this valuable contents should be protected even in a fireproof building, in fact the whole plant should be provided with the usual fire protection and apparatus.

In a fireproof cotton mill an advanced step should be taken by dividing the less hazardous departments from the most hazardous. We know that more fires occur in the picking department than in any other. The less hazardous department could thus have a lower rate on its contents than is usual for the picking department. The lower rate of insurance may not seem large enough to warrant erecting a fireproof building, but everything must be saved in maintenance to apply to the dividend earning power of the mill, as competition keeps on the increase and all manufacturers are studying how to keep down the maintenance cost and meet this competition.

Wire glass and metal frames for all picker room windows would also help this hazardous department. The cost of metal window frames and heavy wire glass has been considerably reduced in the past few years on account of its popularity in concrete buildings where owners desire no woodwork used in the buildings; thus will be seen an additional advantage to concrete by the saving of an outside picker house by having the department located in the main mill. These small outside buildings add to the total a considerable cost on account of its small floor area to the size of buildings and outside walls.

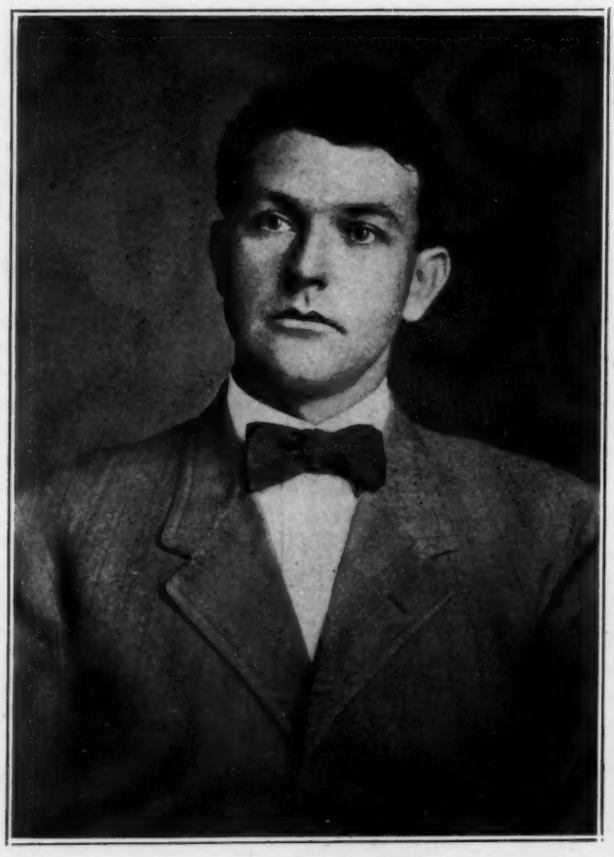
SOUTHERN SUPERINTENDENTS.

T. H. HENDERSON.

T. H. Henderson, who is general superintendent of the Riverside Mfg. Co. and the Toxaway Mills of Anderson, S. C., was born in Laurens county, March 5th, 1877. He was educated in North Carolina, having attended school in Reidsville. His first mill work was in South Carolina when he was with the Pelzer Mfg. Co. at Pelzer. He began his work at Pelzer Mills at the age of 16 years, and was put to doffing in the spinning room. He spent five years in all with the Pelzer Co., filling several different positions in mills Nos. 1, 2, 3 and 4. The last position with these mills was grinding cards and section hand. On resigning at Pelzer, Mr. Henderson went to the Poe Mills, Greenville, S. C., and thence to the Fountain Inn Mills as overseer of the carding room. From there he went to Charlotte, N. C., as second hand in spinning in the Highland Park Mills.

Mr. Henderson received an offer from the Saco & Pettee Machinery Co. textile machinery builders of Biddeford, Me., which he accepted. For this concern he erected machinery in many of the cotton mills throughout the country. Mr. Henderson next associated himself with the Draper Co. Hopedlale, Mass. For three years Mr. Henderson installed machinery for this concern, in the Southern States.

Nine years ago he decided to abandon this kind of work, which required extensive traveling, and settled in Anderson to become section hand in the spinning room of mill No. 1 of the Anderson Cotton Mills. He was soon promoted to the position of second hand in spinning. Some time afterwards he accepted the position of overseer of spinning in the Cox Mills of Anderson.



T. H. HENDERSON.

Mr. Henderson returned to the Anderson Mills later, and became overseer of spinning in mill No. 2. He remained at this position for nearly three years and then went back to the Cox Mills to become overseer of spinning in the old and new mills.

Resigning from this position he went to the Gluck Mills in Anderson as overseer of spinning and held this position for 15 months.

He then became connected with the Pendleton Cotton Mill, at Pendleton, S. C., as local manager and superintendent. This position he held for one year, manufacturing 30s two-ply goods. D. P. McBrayer is president of these mills, and needing a man of Mr. Henderson's experience at his mills in Anderson, he sent him there and appointed him general superintendent of the Riverside Mfg. Co. and Toxaway Mills, the first of which manufactures yarns, and the second manufactures print cloth. Mr. Henderson has installed new machinery at both of these mills, and is at present installing the latest improved Saco & Pettee machinery in the Toxaway Mills, which will increase their output 20 per cent. Mr. Henderson has been employed by President McBrayer for four years, one year at Pendleton and three years at Anderson. At present, Mr. Henderson has eight overseers under him.

BRITISH COTTON TRADE NOTES.

ELECTRIC DRIVE FOR LANCASHIRE MILLS. COTTON OPERATIVES' QUESTIONS. SIR ALFRED JONES AND BRITISH COTTON GROWING. BOMBAY MILL INDUSTRY REVIVING.

(*Contributed exclusively to* COTTON.)

BY TEXTOL.

It is believed here that when the trade of the country improves, the electrictrification of cotton and woolen mills will make rapid advance, but at the same time competition between rope driving and electrical driving is likely to remain a long time. As a matter of fact, electrical engineers have not until quite recent times made very strenuous efforts to introduce electrical driving into our mills. In British cotton spinning there are some 57,000,000 spindles at work and the number of looms is approximately 740,000. Less than 2,000 firms control these spindles and looms; very few drive electrically.

The rapid application of electrical principles elsewhere render this rather curious, but the reason can no doubt be very largely found in the fact that conditions are so unstable and vary so much from mill to mill that electrical engineers have not yet properly grasped the full measure of importance to be attached to these variations. At times working on older fixed principles they have installed totally unsuitable drives with subsequent trouble and a general retardation of progress. Steam engineering has been very effective in the past in the cotton and woolen industries, but there is a very large waste of power. For example, a mill recently tested showed that the engine had to develop 1,252 H. P. although the machinery only needed 895 H. P. as the maximum; nearly 40 per cent. extra power was needed beyond what was required for working the machinery. Had that mill been electrically driven, and even had the current been bought through a power supply corporation, the mill owner would only have had to pay for consumption much nearer the figures used.

The whole matter is being discussed here in engineering and textile quarters and it is agreed that many considerable advantages can be claimed in favor of the rapid introduction of the electrical drive in our textile mills. One considerable advantage is, that the prime mover and the machinery can be placed in any relative position, and furthermore each machine can be driven independently without reference to the other. Old fashioned mill owners may argue that it is not necessary to place the prime mover in any other than the position it generally occupies, but your correspondent has been informed of cases in which extensions of the mill have been made which without the electrical drive would have rendered necessary installing considerable lengths of transmission shafting and much gearing, or else a new engine to drive the additional machinery. It is urged that what must appeal very strongly to our cotton spinners is the special steadiness of the electrical drive, and through this it is possible to speed up the shafts or the machines throughout the mill to the very proper end that production is increased. Under special tests it has been found that, in fact, from 4 to 12 per cent. increased production is obtained in an electrically driven mill and one authority in a discussion points out that an increase of 7½ per cent. along these lines is equal to adding 6,000 spindles to an 80,000-spindle mill. Up-to-date American mill owners will not require to have these facts thrust upon them, but they may be interested in knowing that the discussion is hot here now.

It is urged that in putting up new mills the electrical drive should be just such a necessary factor in interior equipment as reinforced concrete is in the outside shell of the building. The result would be that just as decreased cost is secured in consumption, so by dispensing with shafting, pulleys and belting much weight is removed and consequently much lighter structures can be designed and utilized than has been the case hitherto. At one mill in Lancashire in which the power is generated in the mill itself, it is distributed to motors which are ranged in a tower built outside the mill but of course connected with it. Each motor is enclosed in a separate chamber and drives the machinery on the floor opposite that chamber, the shaft passing through a special wall-box. In this way dust-proof motors are not required. Where, however, the motors are employed inside the spinning or weaving departments, dust-proof cases are recognized as necessary.

In conjunction with these notes mention may be made of the discontent in various cotton circles owing, it is alleged, to the crowding of new producers into the industry. Proposals have been discussed with a view to limiting the building of new mills in excess of the present requirements of the trade. The present rate of building must inevitably lead to the dislocation of the market. Put in the form of an illustration, we may suppose that while the actual demand might employ 8 new mills of normal size, there are always easily 10 men with capital to invest, who regard the cotton industry as a suitable field. Each knows, in all probability, very little of the prospects of his competitors, and so 10 extensive mills are erected. The result can only be reduced prices and general trade trouble in the end.

W. Mullin, secretary of the Cotton Trade Card and Blowing Room Operatives' Association, in his quarterly report, says that the law should be amended so as to prevent speculators from floating companies and rushing up mills unless they themselves provide a reasonable amount of capital. He also urges that encouragement should be given to our colonies to grow cotton wherever it is possible to grow it. As to the agitation for the installation of dust-removing appliances from the card rooms, Mr. Mullin says it has been stated that some employers hesitate to introduce such apparatus because they are afraid that a demand will be made for increased wages by men working on the cards. He assures the employers that such a fear is groundless. He advises members to consider the question of a shorter working week, and says that the executive is convinced that a reduction of hours would tend to greater regularity of employment and improve the lives of the operatives. His committee regrets that the recent ballot on the question of half-timers was against raising the age, but feels that there was some reason for the decision, as the day school curriculum is far from satisfactory, there being too much mechanical tuition about it.

Sir Alfred Jones, presiding at a meeting of the British Cotton Growing Association lately made a generous offer of another $125,000 to the funds of the association, provided the Lancashire cotton spinners interested secured subscriptions amounting to $750,000 during the next six months. The work done by the association in the last seven years has been most successful, but funds have been nearly exhausted, and more money is required to extend the movement and assist the colonies concerned in extending the areas under cotton. Sir Alfred Jones has received a very encouraging letter from Mr. Joseph Chamberlain who was secretary to the colonies under the late government and who a few years ago was one of the leaders of the new Imperialist and Tariff Reform party and propaganda in this country. The letter congratulated Sir Alfred Jones on the success of the British Cotton Growing Association, Mr. Chamberlain thinking it most important to the colonies as well as to the prospects of the cotton trade.

A short time ago J. & P. Coats, Ltd. of Paisley, the well-known thread manufacturing firm, placed large orders with Lancashire cotton spinners in yarn. It is stated that the total sales amounted to upwards of 5,000,000 pounds in weight, and the business was distributed among about a dozen concerns. It is understood that the contracts arranged will cover deliveries for about three months. Producers of both carded and combed descriptions in yarns made from Egyptian cotton participated in the business.

Apparently the Egyptian cotton crop this year is likely to be up to the level of the most sanguine expectations. Ideal weather prevails and the condition of the plants is so satisfactory as to point to not only a good first and second, but also a third picking of satisfactory quality. Under these circumstances it seems reasonable to expect that the crop may exceed 7,500,000 cantars, (1 cantar = 95 pounds) an amount that would bring the total output to well above last year's figures. Picking has now become general throughout the whole of Egypt.

From Bombay, India, it is reported that the local mill industry, the credit of which was much injured by the distrust engendered by Dwarkadas Dharamsey's suicide last August, and which has for a long time been depressed, shows signs of revival. A bumper cotton crop is in view and may exceed five million bales. Cotton now arriving is eagerly snapped up. The price of yarn is advancing, and the prospects of the weaving mills are brighter. Manufacturers and dealers sanguinely hope to see their stocks disappear by the end of the year.

COTTON MANUFACTURING

THE EFFECT OF TWIST IN YARNS.

THE EXPERIMENT. ELASTICITY. THE FEEL AND APPEARANCE, INCLUDING COLOR OF SINGLE YARN. EFFECT ON CLOTH—FEEL, COLOR, AND APPEARANCE. EFFECTS ON BLEACHED AND DYED FABRICS.

BY J. M. HEY, J. MUTCH, AND J. SMITH.

Before we consider the results of our experiments upon the effects of various twists in yarn, perhaps it will be as well if we take a brief survey of the treatment which the yarn receives in the final stage of its manufacture. In the form of a thin sliver, containing only sufficient twist to enable it to withstand the strain of pulling around the bobbin upon which it is wound, the cotton is presented to the drawing rollers of the ring frame. As the yarn passes forward between the rollers, the drawing process to which the rove is subjected entirely eliminates the initial twist, but immediately when the yarn passes through the nip of the front roller it is again twisted. It has been claimed that the draft between the rollers causes all of the long fibers to take up a central position in the yarn, and, assuming this to be the case, we get in the complete thread a core of long fibers, with shorter ones twisted around them. The manner in which such a construction affects the quality of the yarn will be considered later.

THE EXPERIMENT.

The object of the experiments was to ascertain the results of varying the amount of twist in single filling yarn upon: (1) The strength of the single thread; (2) its elasticity; (3) the feel and appearance, including color;

Table I.

Cops Tested	A	B	C	D	E
Twisted per inch	11.9	13.1	16.7	19.7	22.6
Twists constants	3.07	3.38	4.3	5.1	5.9
Mean double thread break in ozs.	41.4	45.1	51.4	47.	44.8
Mean stretch in 16ths of an inch	23.4	23.7	26.	23.7	20.2

and upon plain cloth to note the effect of varying the twist in the filling with respect to (a) the amount of contraction in width; (b) its ability to withstand a tensile strain in the direction of the filling; (c) its effect upon the feel, color, and appearance of the cloth; and (d) to observe the effect upon bleached and dyed fabrics.

The yarns were made of good brown Egyptian cotton which was combed during its preparation. The reputed count was 16s, but on wrapping and testing it was found to be actually about 15s. The yarn used in the experiment was carefully tested on the twist tester. Another tester was used in finding the double thread breaks, and a fairly wide range of tests was taken from each of the differently twisted yarns, in order to insure a good average result.

The yarns were first tested for the purpose of finding, if possible, the effect which the amount of twist put in filling yarn had upon the count. The figures obtained show that those yarns which contained least twist were of the highest count, while those containing most twist were of the lowest count. This feature, as will easily be understood, is probably due to the extra contraction of the yarn caused by increasing the twists per inch. From the figures shown in Table I, it will be observed that the yarns tested were lettered A, B, C, D, and E; A having the least twist and E the most twist in turns per inch. In this table we have also given the actual twist constants as obtained from the actual twists in the yarn; these constants

Table II.

Twists per Inch, and Percentage of Variance from the Mean.

Cops	A	B	C	D	E
Highest	14.5	17.	20.	27.	25.4
Lowest	10.	10.5	13.	17.	20
Per Cent	21.8	29.8	22.1	37.	12.

rise for each succeeding thread; thus from A to B we have a rise of 0.31, from B to C of 0.92, from C to D of 0.8, and from D to E of 0.8. The table also shows mean double thread break and also the mean stretch of the different threads. These figures will be afterwards better illustrated by a curve.

With respect to the twists per inch, we have deduced Table II which gives some idea of the regularity of the twists in the various threads. As these figures show, 14.5 were the highest turns per inch found in thread A, and 10 the least, giving a difference of 4.5. The highest in B was 17 and the lowest 10.5, giving a difference of 6.5. The difference in C is 7, in D 10, and in E it is 5.4. On taking these figures and calculating the maximum variance of twist as a percentage taken upon the average, we get the figures shown in lower portion of Table II. Taking the figures in this manner, it is seen that the most highly twisted yarn E is easily the most consistent, for it only varied 12 per cent. from the mean, while the variance in all the others was over 20 per cent., and in two of them it was about 30 per cent. The consistency of the turns per inch in yarn E, relative to the others, was noticeable throughout the tests. We find throughout, however, that the twists per inch were very variable, but this appears to be a characteristic of ring yarn generally.

We will now consider the effects of the turns per inch upon the break and stretch of the differently twisted yarns. The figures shown in Table III give the highest and lowest breaks obtained when testing each set of cops, and

Table III.

Double thread break in Ounces, and Percentage of Variance from the Mean.

Cops	A	B	C	D	E
Highest	48.	51.5	60.	56.	51.
Lowest	34.	30.	44.	38.	39.
Per Cent	25.1	33.3	17.6	19.2	20.5

the percentage of variation from the mean. Here it is noticeable that cop B shows the greatest variation in strength, while the highest break was registered when testing cop C. The difference between the highest and lowest of the breaks for A is 14 ounces; of B it is 21.5 ounces; of C only 16 ounces; with D it is 18 ounces; and with E only 15 ounces. We can see at a glance from the percentages given that C is the most consistent, while B shows the greatest variation. The regularity of C with regard to both break and stretch is quite a noticeable feature in all the break and stretch tests.

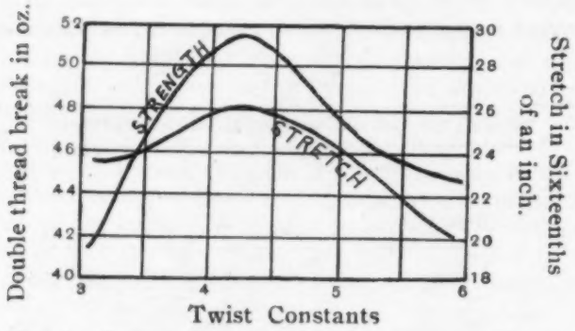


FIG. 1. STRENGTH AND STRETCH CURVES FOR YARNS.

The next item to be discussed are the curves shown in Fig. 1. The strength curve is produced by drawing a line through points made by the intersection of the breaking weight lines of the various yarns with the twist constant lines used. Here at a glance is shown the influence of different amounts of twist upon the strength of the yarn. Thus, when the twist constant was 3.07, making the average turns 11.9, we have a very low breaking weight; but it will be seen that immediately the amount of twist is increased, a rapid rise in strength is brought about until the twist constant has been raised to about 4, the turns per inch then being about 15.5. By further increasing the twist constant, a change in strength begins to take place in the yarn, and, instead of rising, the breaking weight, as the curve shows, begins to fall. Such a result, when we consider what is taking place among the fibers composing the yarn, is only what might be expected. With less twist in the thread the individual fibers are held so that their surfaces press upon each other only very slightly, and consequently the resistance they offer to separation is very small.

As the twist is increased, however, the fibers are pressed into closer contact with each other, and this greatly increases the surface friction, and as a result more difficulty is experienced in pulling them apart. This effect will, of course, be increased according to the natural formation of the cotton fibers. On increasing the twist above a certain point, however, another action is set up, which diminishes the strength of the yarn. This is caused by the twist laying the fibers at a greater angle with the line along which the force is applied, thus, being subject to a cross strain when the yarn is under tension. As a result the thread composed of these fibers begins to weaken. It will be observed that so long as the curve is rising, the increase of strength due to friction on the surface of the fibers is greater than the decrease of strength due to the fibers being at an angle with the direction in which the force is applied. The twist in the thread, therefore, when the highest break is given is the point at which two opposing actions balance each other, and if the twist be further increased, the weakening action of the twist by causing a cross strain on the fibers becomes greater than the strength gained by increasing the grip of the fibers one upon the other, with the result that after this point is attained the more twist we introduce, the less becomes the strength of the thread.

ELASTICITY.

The stretch curve shown in Fig. 1, shows the average stretch of each class of thread. The curve is plotted by finding the intersecting points of the stretch and their respective twist constant lines. It will be seen that this curve bears a certain resemblance to the strength curve, but in the low twisted threads the stretch which corresponds with the break is greater relatively than is the case with the more highly twisted threads.

THE FEEL AND APPEARANCE, INCLUDING COLOR OF THE SINGLE YARN.

We now come to the consideration of the feel, appearance and color of the single threads. In passing we may mention that the yarns containing few turns per inch were soft, light colored and lustrous but on the twist being increased they showed a direct tendency to become harder, darker, and duller in appearance. The "hang" of the threads may here be noticed with advantage. The term "hang" is applied to a method of testing a yarn, for the amount of twist and irregularity, by holding it loosely between the hands. The greater number of twists there are in a thread, the more tendency it will have to curl when given this freedom, but the irregularity of the yarn also tends to cause it to curl more easily; thus by observing the "hang" some idea of the variations in the thickness of the yarn is obtained. Upon inspection of the yarn tested, it will be found upon taking the two extremes, that is, yarns A and E, that A has a dead "hang" and shows little tendency to move, while E has a lively "hang" and shows a marked inclination to curl immediately it is allowed to hang loose.

DESCRIPTION OF CLOTH.

We now come to consideration of the effect that varying the amount of the twist inserted in the filling has upon the cloth. In order to observe this properly, a quantity of the filling was woven. The reed space occupied by the warp was 25 inches, and the cloth width on the counter was found to be 24 inches, thus giving a contraction in the cloth width of 4 per cent. The counts of warp was 40s single, taken two ends in a dent in a 56 reed Stockport counts. The picks put in the loom were 43 per inch, and the gray cloth counted on the table 46 picks per inch, thus giving a contraction in the warp of 6 per cent. The cloths made with the different fillings A, B, C, D, and E, respectively were all measured carefully with the object of observing any difference which the twist in the filling might have had upon the contraction in the width. Very

Table IV.

Cloth Breaks in Pounds, and Percentage of Variance with differently Twisted Fillings.

Cloths	A	B	C	D	E
Highest	320	430	392	393	380
[illegible]	225	288	342	305	250
Per Cent	21.2	20.4	8.5	15.5	21.1

little variation was found, however, in any of the cloths; if there were any difference, the contraction was least in those cloths containing the highly twisted filling. The ends and picks per inch of the five different cloths were also counted with a similar object in view, but again no appreciable difference was found. This, we think, refutes the

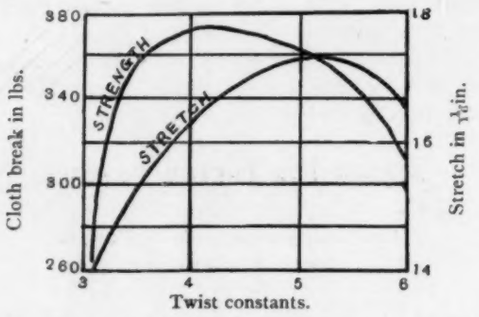


FIG. 2. STRENGTH AND STRETCH CURVES FOR CLOTH.

theory advanced in some quarters that inserting more twist in the filling materially increases the contraction in width of plain cloth. For the purpose of determining the ability of cloth to stand strain in the direction of the filling, the cloths were cut into strips of about 7 inches wide by 12 inches long, and from each side of these strips, picks were taken out until the cloth measured 6 inches in width with a warp fringe at each side. This precaution is necessary, and if not taken, when the cloths are being broken the stretching causes the filling threads at the sides to slip out of the cloth. Such an occurrence would not be conducive to equality in the conditions surrounding the tests.

In order to give you some idea of the irregularity found in the break of the different cloths, Table IV has been prepared. It shows the highest and lowest breaks in the different samples and the percentage of variance in the breaks. The sample containing filling yarn A, now called cloth A, gives a maximum break of 320 pounds, and a minimum of 225 pounds, showing a difference of 95 pounds between the highest and lowest. The percentage column gives a good idea of the variation in the break of the cloths. Here again we have the maximum variation from the mean, taken as a percentage upon the average. The figures show that the breaks of cloth C is far the most regular. It will also be seen that the variation is first high and becomes less as the twist was increased up to C, after which it again becomes greater; at this point a comparison between Tables III and IV will be interesting. In both cases it will be observed that the variance is less when the filling C was being tested.

The strength and stretch of the cloth is graphically shown in Fig. 2. The strength curve was plotted by finding the intersections of the breaking weights with the respective twist constants of the fillings used. In this case the rise in strength due to the first small increase of twist is much greater than it was in the double thread breaks. It is also noticeable that there is less falling off in strength caused by the excessive twist in the filling than is shown by the double thread breaks. The diagram also shows the stretch of the cloth in breaking, plotted in connection with the respective twist constants. Again a similarity between the two curves is noticeable, as was the case with the double thread break and stretch. The conclusion to be drawn from this similarity between the break and stretch curves in both instances is, of course, that those yarns are strongest which will stand most stretching.

EFFECT UPON THE FEEL, COLOR AND APPEARANCE OF CLOTH.

We will now examine the effect of varying the twist upon the feel and appearance of the cloth. As would naturally be expected, cloth A, which contains the least twisted weft, is soft and smooth to the feel. It possesses a good cover and is whiter, brighter, and more lustrous than the cloths containing filling of more turns per inch. The filling threads in this case seem to spread themselves out; they also show a tendency to give away and allow the warp threads to lie straight in the cloth. Upon examining the cloths A, B, C, D, and E in their respective order, we find that as the twist is increased the cloths gradually lose their brightness and luster; they become harder, darker, and much rougher to the feel. Cloth E, which contains the hardest twisted filling, gives a cloth of comparatively very open appearance, and on comparing A and E (the two extremes) there is no doubt that the more the twist is increased the darker and duller does the gray cloth become, in addition to being much harder and rougher to the feel. On weaving the filling E into the cloth, it was found to be impossible, by adopting such methods as increasing the drag on the yarn, to keep it from curling and forming snarls, thereby giving the cloth a most unpleasing appearance.

Another feature which might be pointed out is, that as the filling becomes harder owing to containing more twist (still containing the same conditions about the loom with respect to the weighting of the warp, etc.) the warp appears to be yielding more around the filling, and in

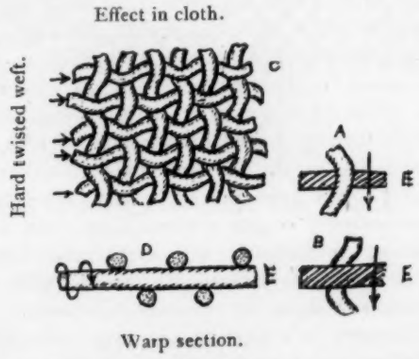


FIG. 3. EFFECTS OF TWIST IN YARN UPON CLOTH.

testing the extremes for regain, cloth A gave 12 per cent. and cloth E 15 per cent. Perhaps the most interesting feature observed in the cloth containing the excessively twisted filling was that both the warp and filling show a decided tendency to form a wave line. The alternate threads taking the turn in opposing directions, thus produce a crossed ogee appearance. For the purpose of illustrating this effect Fig. 3 has been prepared. In Fig. 3, C shows the position of the warp and filling threads as they lie in the cloth woven with the highly twisted filling. The ogee effect has been slightly exaggerated in order to better illustrate what effect this tendency to bend has upon the appearance of the cloth.

We will first consider the causes which operate to bring about the waviness of the warp threads, since in the cloth the bending effect is more prominent in the warp than in the filling. A warp thread as it comes over the filling is represented at A. The twist in the filling E is

indicated by diagonal lines; these lines are not altogether imaginary, for they are formed more or less on the thread by the fibers being twisted around in that direction. This gives to the surface of the yarn something of the nature of a thread on a bolt, only the angle at which the thread runs is much steeper. Suppose the filling thread E is pushed in the direction of the arrow, and at the same time it is kept in close contact with the warp thread F, just as it would be when being beaten up in the loom. It is thus evident that if the filling thread can not move sideways, then the warp thread must move instead, and the effect would be to push the warp threads to one side, as indicated at A. At B the warp thread is shown under the filling E, and the angle of the thread on the yarn caused by the fibers twisted around it, is indicated in the same direction as before, but in this case instead of the warp threads being in contact with the top of the filling, it is in contact below. The angle of the fibers underneath the filling is in the opposite direction entirely to that of the fibers above, and therefore, when the filling is pushed in the direction of the arrow, and again kept in close contact with the warp thread, the effect is to push the warp thread to one side, as indicated at B.

Let us now consider the conditions which cause the filling threads to leave the straight line, and assume a position something similar to that shown at C. To do this the diagram D which is a section showing the hard twist filling T coming between the warp, has been prepared. Assume the filling to be twisted filling way, as is indicated by the markings on the thread, then the tendency would be for it to untwist itself in the direction indicated by the arrow. Thus by a rolling action it would tend to come forward at the point where it presses against the bottom threads, and would tend to roll backward at the point where it comes in close contact with the upper threads. The ogee effect thus produced by the warp and filling threads both forming waved lines, combined with less bulk of the yarn due to the excessive twist, tend to give the cloth a very open appearance; in fact upon looking at it with an ordinary counting glass, lines upon a piece of paper placed underneath can easily be distinguished through the interstices between the threads, while the cloth is very close and shows no openness whatever.

EFFECTS ON BLEACHED AND DYED FABRICS.

The effect of various twists in weft upon bleached and dyed fabrics has also been tested. Samples of the cloths were taken and put all together through the usual laboratory bleaching process, and each cloth was subject to the same conditions throughout. After bleaching, the samples were cut up into four sets, and holes were made into three of them to enable each cloth to be distinguished from the others, after they had been dyed. The remaining set was left in the bleached condition without any kind of finish being given to the cloths. In the set left in the bleached condition, it was noticeable that cloth A was much softer than the rest, the others seeming much harder to the feel as the twist was increased. The amount of contraction as a result of bleaching is 3.5 per cent. in length and 6 per cent. in width. Another point we may notice is that the ogee effect and openness of cloth E had to a large extent disappeared. The warp and filling threads lay straighter than they did in gray cloth. As regards color and appearance, there is now less difference than was noticed in the gray cloth but the weave was still more evident in the cloth with the highly twisted filling.

The remaining sets of cloth were dyed, each set being placed in one dye bath, and the separate cloths of each set were as far as possible kept under the same conditions. One set was dyed with Erika, a direct dye. The second set was dyed with a sulphide dye, the color chosen being Immedial orange. The third set was first tanned, and afterwards dyed with rhodamine red, a basic dye. There is very little difference in the dyed fabrics due to the variation of twist in the filling. If there be any it was so small as to be negligible.—JOURNAL OF THE MANCHESTER TEXTILE SOCIETY.

DESIGN FOR COTTON FABRICS.

(*Contributed exclusively to* COTTON.)

BY J. W. KIRKWOOD.

Designs Figs. 1 and 3 are neat styles of Oxford shirtings which are quite popular at present. The respective designs and drafts are shown in Figs. 2 and 4. The particulars are: 40 dents per inch, 2 threads in a dent; 32s warp.

46 picks per inch; 12s filling. The threads indicated by dots in Fig. 4 denote where colored threads come in the pattern. The warping pattern is as follows:

WARPING PATTERN.

16 threads white 32s
4 threads blue 32s
4 threads white 32s
4 threads blue 32s
4 threads white 32s
4 threads blue 32s
16 threads white 32s

52 threads per pattern

The threads indicated by dots in Fig. 2 show where white threads are used in the pattern. The warp arrangement for Fig. 2 is as follows.

WARPING PATTERN.

2 threads white 32s
2 threads blue 32s
2 threads white 32s
2 threads blue 32s
2 threads white 32s
6 threads blue 32s

16 threads per pattern and two patterns in repeat of full design.

These cloths are generally made 34 inches in the reed for a 32-inch cloth, so that 80 threads per inch × 34 inches in the reed = 2720 threads in the warp.

80 yards of warp produce about 74 yards of cloth.

$$\frac{2720 \times 80}{840 \times 32} = 8.09 \text{ pounds warp.}$$

$$\frac{46 \times \times 74}{840 \times 12} = 11.48 \text{ pounds weft.}$$

Total weight of warp and weft = 19.57 pounds.

74 ÷ 19.57 = 3.78 yards per pound.

The sample of cotton cloth shown in Fig. 5 is a neat and novel effect for shirtings of a good quality. The design, drawing in draft and harness chain are given in Fig. 6. The particulars for its production are: 40 dents per inch,

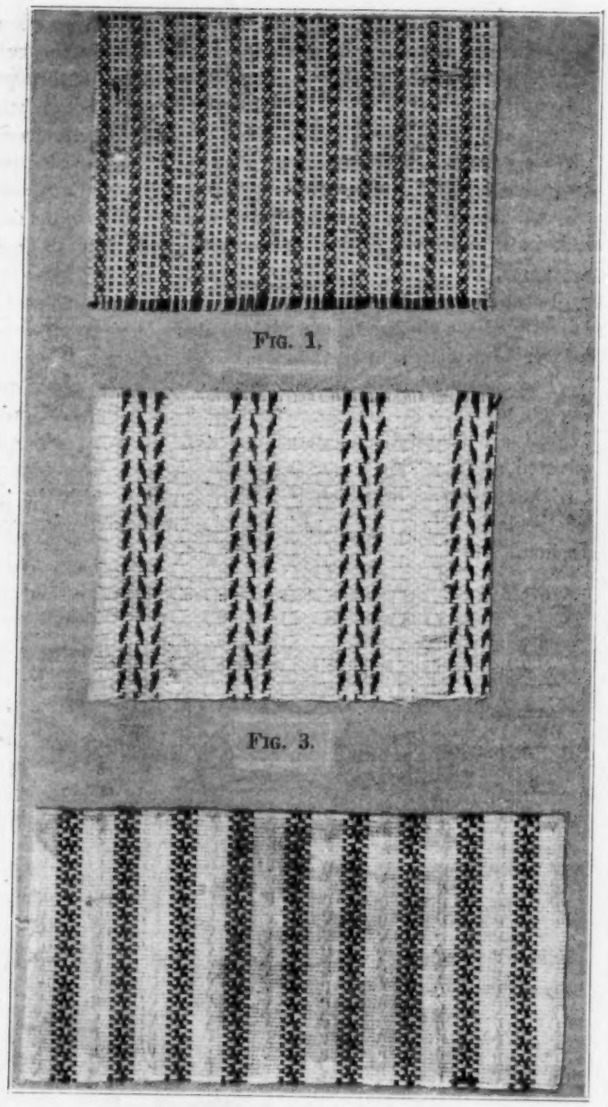


FIG. 1.

FIG. 3.

FIG. 5.
SAMPLES OF COTTON FABRICS.

2 ends in a dent, 40s and 20s Egyptian carded yarns for the warp. 40 picks per inch of 10s carded Egyptian filling. The warp is 34 inches wide in the reed for a 32-inch cloth—68 yards of warp will be required to weave 64 yards of cloth. The calculations for the cloth are as follows:

WARPING PATTERN.

12 threads navy 40s
6 threads white 40s
4 threads white 20s
6 threads white 40s

28 threads per pattern

80 threads per inch × 34 inches reed = 2720 threads in the warp.

2720 ÷ 28 = 96 patterns and 32 ends selvage in warp.
24 threads 40s per pattern × 96 = 2304 threads
4 threads 20s per pattern × 96 = 384 threads
32 threads 2/40s selvage 32

2720 Total.

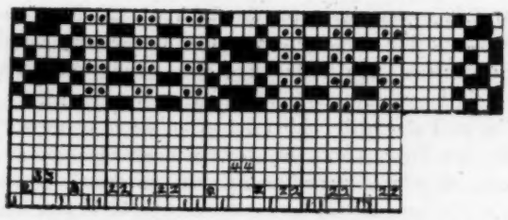


FIG. 2. DESIGN AND DRAFT FOR SAMPLE FIG. 1.

Weight of 40s warp is:

$$\frac{840 \times 40}{2304 \times 68} = 4.66 \text{ pounds.}$$

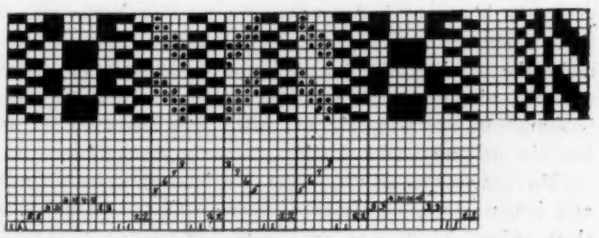


FIG. 4. DESIGN AND DRAFT FOR SAMPLE FIG. 3.

Weight of 20s warp is:

$$\frac{840 \times 20}{384 \times 68} = 1.55 \text{ pounds.}$$

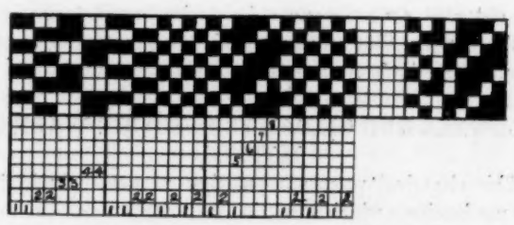


FIG. 6. DESIGN AND DRAFT FOR SAMPLE FIG. 5.

Weight of selvage is:

$$\frac{840 \times 20}{32 \times 68} = .13 \text{ pounds.}$$

4.66 + 1.55 + .13 = 6.34 pounds weight of warp.

Weight of filling is:

$$\frac{40 \text{ picks per inch} \times 34 \text{ inches wide} \times 64 \text{ yds. cloth}}{840 \times 10}$$

= 1035 pounds filling.

6.34 + 10.35 = 16.69 pounds weight of 64 yds. cloth.

65 ÷ 16.69 = 3.24 yards per pound.

It will be noticed that the 20s yarns is used to give a bold twill effect.

LOOM REEDS.

The purpose of the reed is simply to beat in the filling threads, and furnish a back guide for the shuttle. As the dents furnish more or less of an obstruction to any bunches or knots in the yarn, it is advisable to have them as thin as is practicable, in order that they may offer little surface for side contact, and also be free to give slightly when necessary. In order to have a good running reed, the edges of the dents should be straight and smooth. In nearly every case where mills have complained of shut-

tles wearing excessively on the back, it has been because the dents of the reed were sharp, thus scraping the backs of the shuttles, like a fine file, and fluting them so that they looked something like a miniature washboard.

The reed should be either set in an exact plane with the shuttle box back plates, or slightly back to allow for variations, as it will plane the side of the shuttle if too far front. The reed should be set at exact right angles with the shuttle race, the hand rail or reed-cap being filed to fit, and forced firmly into place.

In the manufacture of reeds, the straightening and polishing of the dents is by far the most expensive and slowest part of reed making, and when not properly done, simply indicates a poor job, and an attempt to make an extra profit. Sharp reeds are also very hard on the warp yarn, the blame of bad running warp often being put on the quality of the yarn, when it is really the reeds that make the trouble. To test a sharp reed, draw the finger nail edgewise across it, and if it wears the nail, the reed is sharp and not properly polished. The dents should not bite the nail any, and should, of course, be in line.

Manufacturers should insist on having smooth reeds, and inspect them carefully to be sure that they get what they order. There are reed manufacturers who supply proper reeds and have pride in their reputation. The reed dents should be as thin as possible, to allow elasticity and can, of course, be made deeper, if the thinning is inexpedient without it.

The manner of holding a reed in the lay is not so positive as it might be, since reeds vary so much in contour. The old reed groove system, in its improved form, is used by the Draper Co., and is considered one of the most satisfactory methods at present.

COLDWELL AND GILDARD'S ELECTRIC WARP STOP MOTION.

This electrical warp stop motion consists principally of two mechanisms which work in conjunction with each other. One is located under the warp behind the harness, and the other is placed at the front of the loom to operate the shipper handle when a thread breaks.

The details of the stop motion are best shown by means of the accompanying illustrations, of which Fig. 1 is a partial side view of the warp detector mechanism; Fig. 2 is a detailed view of the electro-magnet for operating the warp stop motion, and Fig. 3 is a perspective view of a portion of the loom-frame, showing the belt shipper and the application of the warp stop motion mechanism.

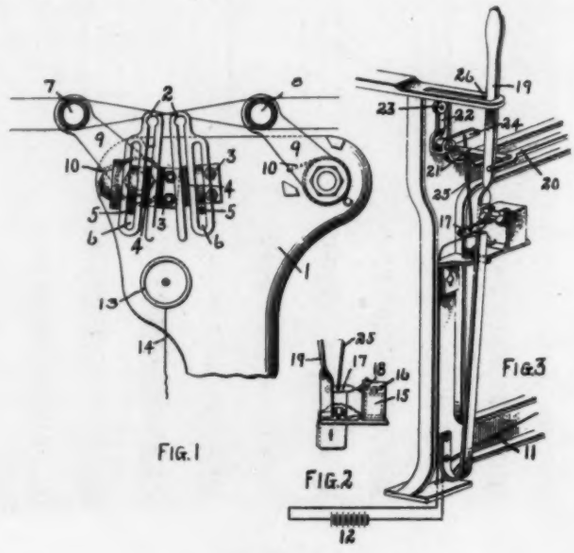
To the side frame members are adjustably bolted the upright angle brackets 1 which sustain the various contact devices for the warp stop motion. The drop wires or bars 2 are arranged in two sets, the drop bars of one set being sustained by one series of threads, and forming a lease with the other series which sustains the other set of threads. Attached to the angle brackets 1, are plates 3 which sustain the contact bars 4. The drop bars 2 are placed on these contact bars, and are held in position also, by means or rods 5 in the slots 6.

The lease rods 7 and 8 are carried on pivoted arms 9 which are controlled by springs 10 and hence allow more or less movement of the lease rods during the weaving operation. These lease rods also act to sustain the threads carrying the drop bars 2 and keep them in a normal position.

The contact bars 4 are connected by a wire 11 to the electric battery 12 and form the upper part of the electric circuit. The other part of the circuit is made through a copper roller 13 which is electrically connected to the battery 12 by a wire 14. Electric current can only flow through a complete circuit, and hence with the drop bars all held up by their respective threads, there is no complete circuit for the current. However, when a warp thread breaks, the drop bar which had been held up by it, will fall into contact with the copper roller 13 and hence act as a connecting link in the electric circuit, and current will flow through the wires.

Located on this electric circuit is an electro-magnet 15. Directly above the magnet is an armature 16 supported on a lever 17 which is pivoted at 18.

The shipper handle 19 operates the belt fork 20. Resting on the fork 20 and in contact with the shipper handle 19 is the horizontal arm 21 of an elbow lever 22 which is pivoted at 23. This elbow lever 22 carries a pivoted arm 24, the outer end of which is held out of line with the lay of the loom when the loom is running and no threads are broken.



PRINCIPAL PARTS OF THE WARP STOP MOTION.

A wire 25 connects the arm 24 to the lever 17, so that any movement of the latter is transmitted to the arm 24.

Thus, all of the necessary connections have been explained. When a thread breaks, the circuit is completed and the electro-magnet is energized. It will then attract the armature 16 downwardly and cause the lever 17 to rise. Thus, in turn through the wire 25, it raises the arm 24, and brings it in the path of the lay of loom. The latter strikes the arm 24 and forces it backwardly. This action causes the horizontal arm 21 to force the shipper handle 19 out of its retaining notch 26, and it springs to the other end of the groove. The belt fork is thus operated and the loom stopped. When the thread is again tied into the loom, the drop bar 2 is raised and the electric circuit broken. All of the parts then regain their original positions previous to the breaking of the thread.

The Japanese, who are the principal foreign buyers of Chinese raw cotton, are interested in its betterment. A Japanese firm is experimenting at Nangwang, Province of Kiangsu, with cotton seed obtained from several countries.

WOOL MANUFACTURING.

BLENDING OF COTTON AND WOOL.

(Continued from August.)

SUITABLE MACHINERY FOR A CERTAIN BLEND. PREPARATION OF THE BLEND. WILLEYING. SCRIBBLING. CARDING. CONDENSING.

(Contributed exclusively to COTTON.)

BY JOSEPH H. BARKER.

It may be assumed that it is always the intention of the woolen manufacturer to obtain the very best results from the use of any given kind of material or combination of materials which he may be using; and in order to do that effectually, there are two important points to be considered: First, the selection of raw material suitable for the goods to be manufactured; and secondly, the use of machinery suitable for operating the material to be used. Unless the scribblers, carders and condensers, and the card clothing be of a kind suitable for the material to be operated, the result will be more or less unsatisfactory.

As a rule each woolen mill is equipped with machinery suitable for the manufacture of goods of some more or less clearly defined class, character, or quality; it may be in one case for low, coarse, thick goods; in another for very fine, thin, all wool goods; or in another case for manufacturing mixtures of wool and cotton.

To attempt to manufacture all wool goods in plain solid colors, either dyed in the wool or in the piece, in a mill and on machinery used for cotton manipulation, would almost certainly prove disastrous to the all wool goods, because during the operation of scribbling, accumulations of short, dirty fibers (called "fud") become so embedded beneath the surface of the cards that the opposing card surfaces can not engage them and carry them forward in the usual manner. The accumulations then become so great that the cards become choked almost up to the points of the card teeth, and can not then scribble or card the wool effectually. When that condition arises, it becomes necessary to "fettle" the cards and remove the accumulation of fibers. This is generally done by hand, by means of fettling combs.

In doing this, it is next to impossible and at the same time not desirable to remove all the fud, but to leave some in the bottom of the wires. Almost invariably some of the loose fibers remain near the surface of the wires, and when the machines are started up again, some of these loose fibers are carried away along with the wool which is being scribbled, and become mixed with it. If a blend consisting of wool and cotton had previously been scribbled on the machines, some of the loose fibers would be cotton and becoming mixed with the all wool blend, would give to it the appearance of a mixture, or the cotton might possibly appear as small spots or "swats."

That mill may be deemed fortunate, which has a carder who thoroughly understands the scribbling and carding of one class of material. The art of scribbling can not be learned entirely from books, nor in a year; it can be acquired only by long experience. It requires a fine discriminating judgment in the adoption and use of the proper means to the desired end, which long observation and experience only can give.

The preparation, mixing, scribbling, and condensing of a mixture of wool and cotton may now be considered, and we will take a blend or mixture of long, coarse wool and shoddy, with cotton; such a blend for instance as would be suitable for low blankets, rugs, or other low coarse cloths. The question of preparing the wool and cotton separately before blending the two together in the case of fine goods, has already been dealt with.

In the case of thick, coarse goods such elaborate preparation is not so necessary, although care of another sort has to be observed. In the case of such a blend as we are now to consider some questionable idea of economy in cost, might possibly lead to the wool being blended without first being scoured; such a coarse is not unusual, although the economy is doubtful. There is to be considered the question of the heavier weight of material to be operated, consequent upon the grease and dirt and possibly lime in the case of slipe wool, in the wool, which has eventually to be washed out. There is the further question of the damage to the card clothing due to the lime, sand, etc., in the wool, which have a most injurious effect both upon the wire and the leather of the cards.

The life of cards used in scribbling such material seldom exceeds from three to five years, and is often much less; whereas cards which have been used exclusively for scribbling fine, clean scoured wool, oiled with pure olive oil only, have been known to last for thirty years. In making yarns from a blend in which the wool has not been scoured, there is an element of uncertainty in forming a correct estimate of the probable loss in weight which will take place when the cloth is finally washed and freed from all of these impurities; and also in fixing the thickness to which the yarns should be spun in order to produce a cloth of the requisite character and thickness. The accuracy of judgment which long experience enables those engaged in this trade to acquire is remarkable, and can only be obtained through experience.

PREPARATION OF THE BLEND.

In such a blend as we are now considering—composed of long, coarse wool, shoddy, and cotton, the cotton used would be cotton waste or fly on account of economy and would be already well opened and in proper condition for being mixed with wool without any further preparation.

We shall assume the blend to consist of equal proportions of wool, shoddy and cotton. In mixing the blend, the different kinds of stock should be arranged in layers, one upon the other on the floor of the preparing room, with the wool on the bottom. The wool should be oiled before the next layer is placed upon it, this will be shoddy which has already been partially oiled. By this method the oil comes between the wool and the shoddy and lubricates both. The layer of cotton comes next in order, and is thus kept for the time being from immediate contact with the oil. This is very desirable, owing to its great affinity for and tendency to absorb the oil which it does not require, and thus deprive the wool of its requisite amount.

This process is repeated until the whole of the raw materials are arranged in one large pile upon the floor. The quantity of oil to be applied depends upon the oiliness of the shoddy. The amount of oil by weight, including the oil already in the shoddy, should be 20 per cent. of the weight of the woolen material in the blend. However, this statement should be modified by the fact that the quantity would be regulated according to the kind and quality of the oil used. If time and other conditions permit, the blend should then be allowed to remain undisturbed for some hours, in order to give time for the oil to become absorbed by the wool and shoddy.

The usual practice is then to more perfectly mix the three materials together by beating down the blend with sticks, called beaters, beginning at one end of the pile and breaking the material from the pile and tossing it about and mixing it into one conglomerate heap, in which condition it is ready for the willey or teazer as the case may be.

If the wool is matted together to any extent it should certainly be passed first through the willey. Some manufacturers would willey the wool before making the blend. In passing the blend through the willey and teazer, the oil becomes more perfectly and evenly distributed and absorbed.

SCRIBBLING.

The blend now is ready for the scribbling process. The scribbler should be 72 inches wide on the wire, and consist of the usual lattice feed sheet and feed rollers, with a licker-in 12 inches in diameter, clothed with strong diamond-point fillet wire; a breast cylinder 36 inches in diameter, mounted with a stripper to clear the licker-in; two workers and two strippers of 7 inches and 4½ inches diameter respectively. There should be neither a breast doffer, nor a fancy on the breast, so that no fancy should be brought into use until the locks of wool have been perfectly opened and the fibers separated from each other. If a fancy were allowed to come into operation while the locks were still only partially opened it would probably result in the partially opened locks being rolled again into lumps almost as compact as they were before. If, however, the wool is carried forward through the breast with its two workers, and through the first swift with its four workers before a fancy is brought into operation, the locks of wool are so perfectly opened that there is no probability of their being rolled into lumps again by the fancy.

The speed of the breast should be about 40 revolutions per minute. This question of comparatively low speed for the breast is of importance for the reason that with a low surface speed, the locks of wool are opened more gently and a longer average length of fibers is obtained than would be the case with a high surface speed.

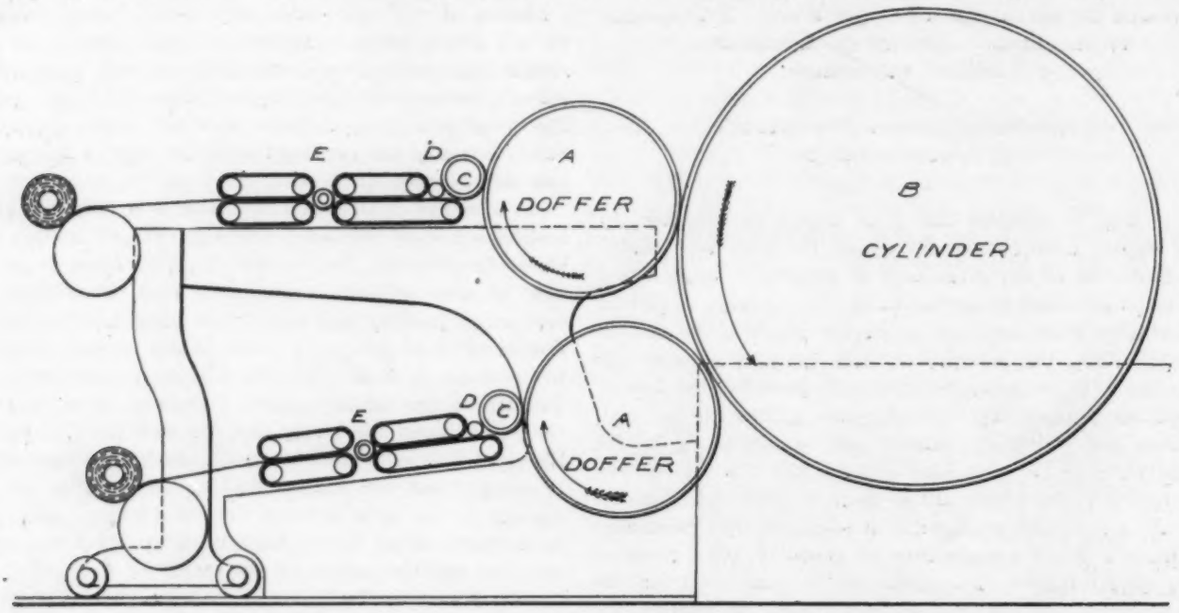


FIG. 9. DOUBLE DOFFER CONDENSER, SHOWING TANDEM RUBBERS.

In addition to the breast, there should be three swifts of 50-52 inches diameter, each with four workers and four strippers of 7 inches and 4½ inches in diameter respectively, an angle stripper 5 inches in diameter, and a fancy of 12 inches in diameter. Each swift should have a doffer 26 inches in diameter, and the speed of the swifts should be 60 revolutions per minute.

FEEDER AND CARD.

The Scotch feeder is the most suitable for this kind of work, and is generally used. The carding engine should be 60 inches wide on the wire, and should be fitted with a licker-in 12 inches diameter, covered with strong diamond-point cards. It should consist of a breast 36 inches in diameter, mounted with an angle stripper to clear the licker-in; two workers and two strippers of 7 inches and 4½ inches diameter respectively. The speed should appropriately be the same as the breast of the scribbler. Some manufacturers would install a breast doffer and breast fancy, but fancies are a necessary evil under any circumstances, and quite as good results would be obtained if they were omitted.

There should be two swifts, each 50-52 inches diameter each mounted with an angle stripper, four workers and four strippers of the same diameters as those on the scribbler, and a fancy 12 inches in diameter. The first swift should have a doffer 26 inches in diameter, and to the second swift should be attached the condenser. The speed of the swift should be appropriately the same as those of the scribbler.

THE CONDENSER.

The type of condenser most generally used for this class of work is the double-doffer condenser, for the reason that the slivers can be more perfectly separated from each other than they can be on any single stripper condenser yet invented. On the single stripper condensers, the slivers are so closely in contact with each other, that when operating long wool, it has been found impossible to prevent what is called "lugging," that is, the long fibers of one sliver cross the dividing space and form a part of both slivers. A diagram of a double doffer condenser is shown in the accompanying Fig. 9.

The doffers A are usually 22-24 inches in diameter and are mounted one above the other in contact with the cylinder B, with a space of about four inches between the contiguous surface of the doffers. Upon each doffer are mounted card rings C, equal in number to one more than half the number of good slivers to be taken off of the machine. The card rings of one doffer are in alignment with the spaces between the rings on the other doffer. Assuming that 40 good and 2 waste threads (the edge threads) are to be taken off, then each doffer would be mounted with 21 card rings of approximately 1⅛ inches in width, with spaces of the same width between the rings. Each doffer is stripped of the slivers by a roller stripper D, and has its own set of rubbers E, which are sometimes arranged in two pairs for each doffer on the tandem principle as shown in the illustration, but more often with only one pair for each doffer.

Among the disadvantages of the double doffer condenser, the principle one is that the two doffers rarely deliver slivers of the same weight, thickness, and character. The reason of that is that the top doffer receives its quota of wool first from the full charged cylinder, and almost invariably takes more than its proper proportion by dragging some of the longer filaments from the portion of the surface of the cylinder which is appropriated to the supply of the lower doffer.

It is not unusual to find the slivers from the upper doffer to be from 10 to 15 per cent. thicker than those from the lower, which excess of weight consists mainly of the longer wool, and thus the two sets of slivers are not of the same character as regards the length of wool. Consequently, these slivers can rarely be spun together on the same mule at the same time. If that were to be attempted, the threads made from one sliver would be thicker, straighter and stronger than the one from the other, which would be soft, imperfect, irregular in thickness, and quite unsuitable for warp and probably even for filling.

The general practice therefore is to spin the slivers from each doffer on separate mules or at separate times, and in each case to adjust the length of the take-in, the twist, and the draft to suit each set of slivers. When they are thus spun separately, the slivers from the top doffer, which contain the larger proportion of the longer wool are generally spun into warp, and those from the lower doffer into filling, the threads for which are generally required to be both thicker and softer than the warp threads.

Another difficulty which frequently arises in connection with the use of double doffer condensers is the presence of distinct tracks upon the card surfaces of the carding engine, corresponding in number, and being in alignment with the card rings on the doffers. This is generally due to the cards in one set of tracks being more or less choked with wool, which has not been carried away by one of the doffers. This condition may be accounted for by the fact that when it is discovered that one doffer is delivering thicker slivers than the other, an attempt to correct this inequality is made by altering the setting of one of the doffers. This is usually done by setting the upper doffer slightly away from contact with the cylinder, the idea being that it would then take off less wool and form a smaller sliver. However, this procedure is not effectual and must lead to serious complications and faults, because if either doffer did not clear all the wool from its own tracks, there would be a gradual accumulation of wool on those tracks, which would presently choke the card and would eventually be taken away by the doffer in a matted and lumpy condition.

It is practically impossible to adjust and set any condenser, which strips simultaneously at two places, so accurately as to deliver two sets of slivers of exactly the same thickness, and in actual practice they are rarely found to be even enough alike to permit of their being spun on the same mule.

(*To be continued.*)

KNITTING

TYPES OF FEEDS ON LOOP WHEEL KNITTING MACHINES.

THE USE OF THE CLEARING BUR. THE DIVIDING BUR. SINGLE PLUSH WORK, AND PATTERN BACKING CLOTH. DOUBLE PLUSH.

(*Contributed exclusively to* COTTON.)

BY ERNEST TOMPKINS.

PART II.

(*Continued from September.*)

Up to this time the discussion has not considered the "clearing" bur. There are two reasons for this; the clearing bur does not do anything toward forming the stitch, and it is not always used. The general object of the clearing bur is to clear obstructions in the needles out of the way of the sinker. However, there are at least two specific uses of the clearing bur; namely, the general use just mentioned, and in plush work to carry the backing thread down out of the way of the binder sinker. The latter use belongs in the discussion of plush feeds.

Returning to the general use of the clearing bur which may be defined as that of a safeguard to help the push-down in cases of necessity, we find a difference of opinion regarding the direction in which the clearing bur should move the obstructions—whether down toward the shank of the needle or up toward the head. The latter method is the less used and may be considered first. Under ordinary conditions the push down will move the old stitches down on the shanks of the needles so that these stitches will pass under the sinker without being "picked up."

However, a thick place in the yarn such as a knot, slub,

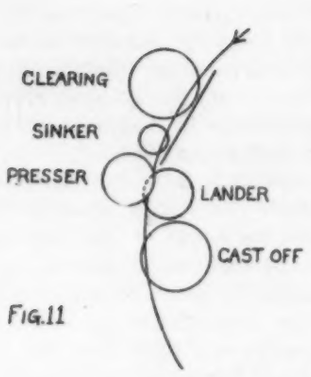


FIG.11

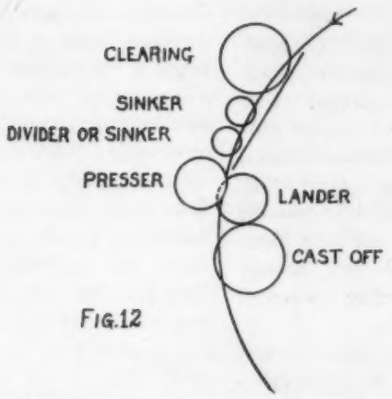


FIG.12

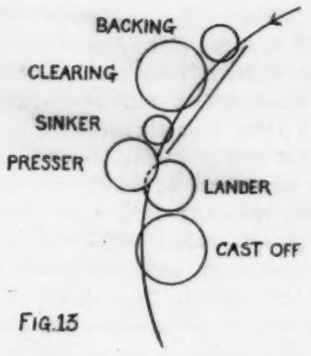


FIG.13

DIAGRAMS OF DIFFERENT TYPES OF FEEDS FOR LOOP WHEEL KNITTERS.

large seed, etc., might fill the space under the beard so tightly that it will not cast off; in this case it passes to the succeeding push down, lodges under the beard of the needle, and possibly catches on the head of the needle. Three things are then likely to occur; if it is well caught on the head of the needle the stitch will probably be broken under the action of the push down; or if the yarn is strong the cloth in this location will not be pushed down but will run right into the sinker; or the obstruction, whatever it is, will come down on the outside of the needles without having been formed into stitches making a looped thread on the back of the cloth, which the sinker bur is likely to catch or "pick up," as it is termed. Since the two ends of the loop are knit into the cloth and the push-down will not let the cloth come up, the sinker can pull the loop up only far enough to take out the slack after which the sinker is pulled backward so that it generally interferes with the needles and breaks some of them. If the sinker bur is supported so that it may back out of the needles under this strain it may drop the loop before much damage is caused.

It is evident from the foregoing that if the obstruction could be surely cast off, it would not cause trouble because when once over the head of the needle the push-down would get it out of the way of the sinker. Here is where the division occurs regarding the operation of the clearing bur; the minority make the clearing bur run upward in the needles and place it just ahead of the push-down. In other words they clear the needles with the use of an extra and outside castoff. This use is analogous to the "cure or kill" method in medicine; the obstruction is crowded so tightly into the heads of the needles that if it does not turn onto the inside of them it is very likely to remain bound under the beards of the needles where it causes a serious smash when it reaches the sinker. A feed equipped in this manner would be similar to the arrangement shown in Fig. 11, except that the push-down would be sufficiently short to allow the stitches to pass the clearing bur before the push-down depresses them.

In most cases the clearing bur is arranged to move the obstruction downward from the head of the needle to the base. This requires that the push-down shall extend ahead of the clearing bur or "cover it," as it is called. Consequently, the use of a clearing bur increases the space taken by the feed and thus reduces the number of feeds that can be placed on the cylinder. This increase in the length of push-down, which sometimes excludes the use of rotary push-downs and sometimes decreases the number of feeds causing a decrease in the production of the machine, constitutes a prominent objection to the use of clearing burs. Experience shows, however, that the decrease in waste resulting from the use of the clearing bur, more than counterbalances the objections to the extension of the feed. Some mills compromise by using a clearing bur on every other feed. The customary plain feed with clearing burs is made up as shown in Fig. 11 as follows: (1) Push-down; (2) Clearing bur; (3) Sinker; (4) Presser; (5) Lander; (6) Inside castoff.

THE DIVIDING BUR.

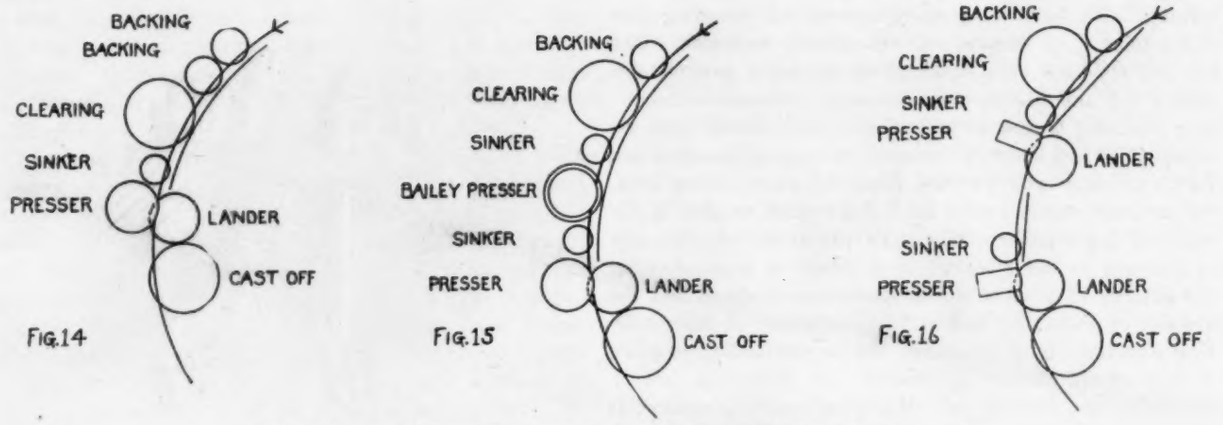
Up to this time the question of dividing the loops or of "evening" them has not been considered; however, this is important on the fine gauges and especially with fine yarn, and has come into prominence on all gauges for worsted, mercerized, and silk yarns, which most require the dividing operation. There is a difference of opinion regarding the utility of the divider, which is a sinker with nibless blades running in the needles immediately after the sinker, and dividing the new loops ahead of the presser. Some knitters claim that a divider merely takes up valuable space without adequate return. Other knitters claim that its use is indispensable for good work. This difference of opinion may be accounted for almost entirely by the lack of a comprehensive knowledge of the subject.

In the first place we may state that the more uniform the stitches are made, the more perfect the fabric will be. The only question then, is whether the divider makes the stitch more uniform. It does when the yarn is light and the stitch is short for the gauge, because under these conditions even soft spun combed cotton will twist after leaving the sinker. However, this twisting decreases with an increase in the weight of the yarn or length of the stitch—one or both—until, with yarn and stitch exactly suited for the gauge, the loops remain so uniformly divided that dividers are regarded as superfluous.

The customary arrangement where dividers are used is shown in Fig. 12 and is as follows: (1) Push-down, generally stationary; (2) Clearing; (3) Sinker; (4) Divider; (5) Presser; (6) Lander; (7) Inside castoff. This is a popular feed for gauges from 27 to 33 with light yarn and a tight stitch. This also illustrates the arrangement for a two-thread feed with two sinkers if the divider is made a sinker.

SINGLE PLUSH.

Single plush is plain work with a thread laced between the courses. The feed is a combination of a backing and clearing bur with a plain feed. The backing bur laces the backing thread in the needles; the clearing bur pushes the



DIAGRAMS OF DIFFERENT TYPES OF FEEDS FOR LOOP WHEEL KNITTERS.

backing thread down out of the way of the sinker; and the plain feed makes the face of the cloth. The push-down covers the backing, clearing, and sinker; ordinary practice is divided between using a short stationary push-down and a large cloth wheel. The feed is made up as illustrated in Fig. 13, as follows: (1) Push-down; (2) Backing; (3) Clearing; (4) Sinker; (5) Presser; (6) Lander (7) Castoff.

Pattern backing cloth is made with this feed by using different colored backing yarns at succeeding feeds and different patterns in the backing burs, so that each thread will be alternately tied closely into the face under another backing thread or floated over it. The celebrated vertical stripe in backing cloth, about which there was so much litigation, is made in this way. When more elaborate patterns or heavier backing is desired, two backing burs are used at each feed. This arrangement is illustrated by Fig. 14, and is as follows: (1) Push-down; (2) Backing; (3) Backing; (4) Clearing; (5) Sinker; (6) Presser; (7) Lander; (8) Castoff.

A single cloth wheel will not cover the first four burs to advantage, so in this case a stationary push-down is generally used. A preferable arrangement, however, is the combination of a stationary push-down followed by a medium sized cloth wheel. The tail end of the push-down is cut out, so as to pass under the hub of the cloth wheel if desired. In this way the push-downs are made adjustable to an extent that one or two backing burs may be covered as desired.

Double plush backing cloth with a two thread face, one of which threads, called the binder, ties the backing into the webbing. This method of tying the backing, if properly carried out, keeps the backing out of the face of the cloth.

The old method of making double plush was to use a plush presser or Bailey presser for raising the backing and binder up over the beards of the needles, the feed for which is illustrated by Fig. 15. It is made up as follows: (1) Long stationary push-down; (2) Backing; (3) Clearing; (4) Binder sinker; (5) Bailey presser; (6) Face sinker; (7) Presser; (8) Lander; (9) Castoff.

This method was objectionable owing to the liability of the plush presser to smash needles when the quarter was being run on or when a bunch ran into the needles. It was therefore superseded by a plush feed with an extra lander, as it was called. In the place of one long push-down, two cloth wheels were used, between which an ordinary type of presser and a lander were used instead of a plush presser. This feed is illustrated by Fig. 16 and is made up as follows: (1) Large cloth wheel; (2) Backing; (3) Clearing; (4) Sinker; (5) Presser; (6) Lander; (7) Small cloth wheel; (8) Sinker; (9) Presser; (10) Lander; (11) Castoff. Practically all of the double plush made in this country at the present time is made with this feed or a variation of it in which the cloth wheels are displaced by a stationary push-down.

(To be Continued.)

THE UNDERWEAR KNITTING MILL.

CUTTING DEPARTMENT. KEEPING A RECORD OF THE WORK. FLAT AND RIBB GOODS. SPRING NEEDLE MACHINES FOR FLAT GOODS. PRODUCTION OF THE FLAT GOODS KNITTER.

(Continued from November.)

BY C. O. TERWILLIGER.

PART II.

We must next select a man to take charge of the cutting department. This man may be paid by the piece, in which case he hires and pays for his own help, or he is given day wages to see that the work is cut properly and to keep account of the orders, etc.

The cloth as it comes from the knitting machines contains imperfections, such as holes, drop stitches, black yarn streaks, uneven knitting, and heavy ends. These imperfections must not go into the garments, and therefore should be turned so that they will be cut out with as little waste as possible. It is far easier to cut out the imperfect places, rather than turn them where they will be cut as normal waste. For this reason, it is most necessary to watch the cutting process carefully. A man in one day can easily throw under the table as waste, cloth which if properly cut, would effect a saving of many times the wages paid him.

KEEPING A RECORD OF WORK.

The method of keeping a check on this work is to determine the normal waste, that is, waste made by the cutter, by assuming the cloth to be all perfect. This legitimate waste compared with that produced from day to day, will give a fairly good idea of what this department is doing. The only objection to this system is when bad work is made on the knitting machines; in that case no matter how carefully the work is turned, the result is

a large amount of waste which the cutter can not avoid making. We have tried many systems of recording this work, some quite simple, and others very elaborate. Our best results have been obtained by having a printed slip calling for the following information: Number of knitting machine; weight of roll; dozens cut (shirts, drawers, union suits and sleeves); amount of waste; remarks, etc. Each operator who handles this roll as it comes from the knitting machine, must fill in his respective part of the required information. When the roll is cut up the slip is returned to the office where a record is kept, showing the number of pounds required to cut each dozen and the amount of waste, as well as the production of each knitting machine. In this manner, the superintendent is given a daily record of the department.

Under the heading of "Remarks," an explanation is given of the cause of any imperfect work. Even with this record, it is necessary to watch the cutting very carefully. A prominent superintendent once told me that he could save his salary any day by simply staying in the cutting room. To illustrate this statement more forcibly, suppose the ordinary cutting waste is ½ pound to the dozen, the cloth having a value of 40 cents a pound, and the production is 500 dozens a day. This represents a normal waste of $100 a day. Now, if for certain reasons, the waste amounts to ¾ pound to the dozen, we have a loss of $50 a day above normal. Assuming the goods have a cost value of $5.00 a dozen, the loss represents 2 per cent. of the cost or $15,000 a year. This example is the condition that may be found in more than one mill. In order to get the best results, the foreman of this department must exercise continued vigilance over his help, and consult with the superintendent as soon as he finds bad work coming from the knitting machines.

We have now outlined the necessary qualifications for the foremanship of the three most important departments namely, knitting, finishing and cutting. If these positions

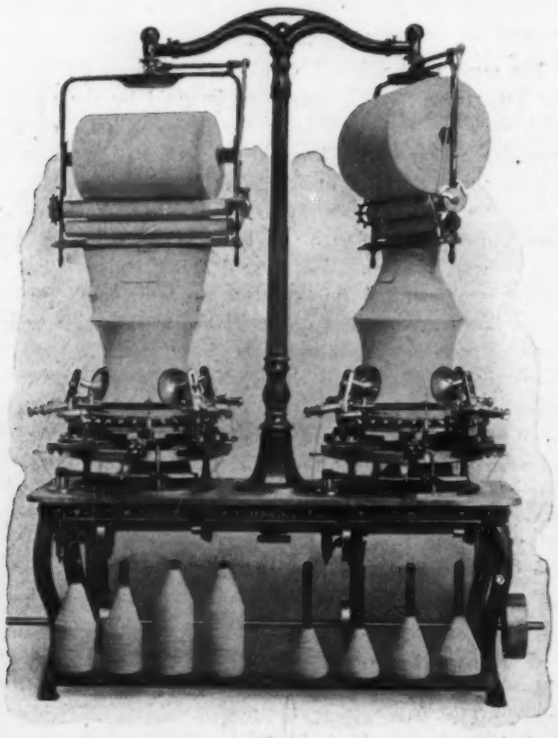


FIG. 1. LOOP WHEEL FLAT GOODS KNITTING MACHINE.

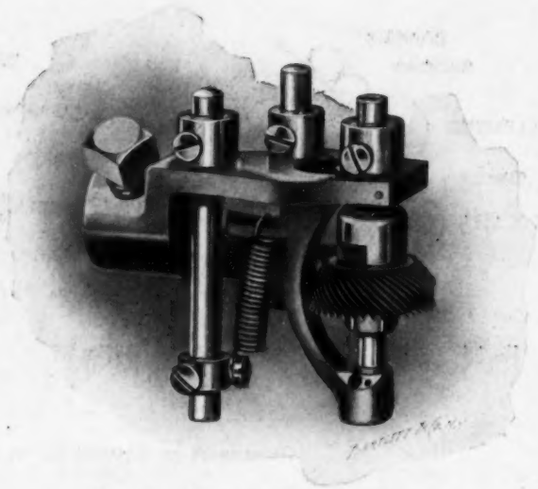


FIG. 2. HINGED STITCH WHEEL.

are properly filled and the management is good, our knitting mill is reasonably sure of success. Where mills do bleaching and dyeing, it is necessary to have a competent foreman over this department, who not only understands the different processes, but also can handle help properly. We will not enter into a further discussion of this subject now, as we have reserved this for a future discussion. In the large mills, there are a few other departments having their respective foremen. These comprise the pressing, folding, boxing and shipping departments. In the small mills these positions are divided among the other foremen.

Before proceeding any further with the subject organization, we must consider carefully the different classes of goods with respect to choosing one or more lines for manufacture, which present the most favorable promise of success. The classes of goods are naturally divided into ribb and flat, according to the types of machines on which they are made. The following are partial lists of the principal staples in each class:

RIB GOODS FOR MEN AND WOMEN.

1. Cotton heavy two-piece garments.
2. Cotton light two-piece garments.
3. Cotton heavy and light union suits.
4. Wool or worsted two-piece garments.
5. Wool or worsted union suits.

FLAT GOODS FOR MEN AND WOMEN.

1. Balbriggans.
2. Lisles.
3. Wool, heavy and medium weight.
4. Worsted plaited goods.
5. Fleece lined cotton and wool.

In the flat goods, there is little demand for women's underwear, the ribb fabric having had the trade for some time. This is also true for infants' wear and children From the ribb goods list it will be noted the many classes of goods made from the ribbed fabric. During the past few years, these goods have fairly leaped into favor. Its principal asset is its elasticity which adapts it for the requirements of the union suit, now becoming so popular for men and women. Just how long this fabric is going to continue in vogue, it is impossible to state. The ever changing requirement of the public may upset any calculations or predictions. About every five years, one hears the report that balbriggans have been "killed." These flat

knit garments have commanded a large sale for years and we dare state that there is hardly a dry goods or furnishing store in the country that does not carry a full line at all times. Quite naturally the ribb goods makers have been after this business for years with the consequent "killing," etc.

Just now balbriggans have had the worst set back in years, as they have not only suffered from the recent business depression, but have had to fight the nainsook (woven), mesh (woven, flat and ribbed), and the union suit. Taken as a whole, the manufactures of balbriggans have found it quite difficult to keep their mills running at anywhere near full capacity. However, from recent reports among the trade, these goods are having a good sale this season and it is probable they will continue to play an important part in the sales for men's wear. In our opinion, the only real competitor of the balbriggan is the ribbed union suit, and it must be admitted that when this garment is made properly, it must take an important position in the knit goods trade. The principal features of the flat fabric are its smooth face and back and the ability to knit it much finer than is at present possible on a ribb machine. As a matter of fact, both classes of goods are smooth and elastic enough for the most discriminating purchaser. Both have their respective merits and the predomination or existence of either class of goods in the future, is a problem for the manufacturer and advertiser. Neither one will control all of the trade for some time to come, and that there is plenty of room for new good lines in both.

We will first consider the winding machine as a necessary part of the machinery for either a flat or ribb goods mill. This machine winds the yarn from the cop or cone to the knitting bobbin and at the same time removes any

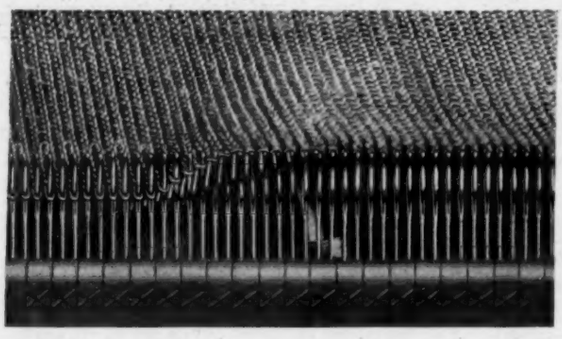


FIG. 3. EVENER CAST OFF WHEEL IN OPERATION.

imperfections in the yarn, such as waste, heavy or thin ends, and large seeds. To obtain perfect knitting, it is necessary to wind the yarn properly. Some knitters go so far as to state that half the knitting is in the winding. Winding machines are made by the Campbell & Glute Machine Co., Cohoes, N. Y.; The Leighton Machine Co., Manchester, N. H., and The Geo. W. Payne Co., Pawtucket, R. I. Each manufacturer makes certain claims for its machine and all are giving satisfaction.

SPRING NEEDLE MACHINES FOR FLAT GOODS.

Of the knitting machines, we will first take up the spring needle flat goods knitter. These are made by Tompkins Bros. Co., Troy, N. Y.; The Campbell & Clute Machine Co., Cohoes, N. Y.; The Crane Mfg. Co., Lakeport, N. H., and the Robt. W. Gormely & Co., Troy, N. Y. These are all of the "loop wheel" class. The imported Terrott machines are now sold in this country by The Grosser Knitting Machine Co., New York. For the present we will only take up the loop wheel machines, as it is on this class that the largest amount of flat goods are made in this country.

Fig. 1 represents the machine as made by Tompkins Bros. Co. The machine consists fo two knitting cylinders. This machine or table as it is called by the makers costs from $562 to $692, depending upon the equipment. This company for the past few years have made a number of improvements in their burr wheels.

Fig. 2 shows the hinged stitch wheel used in this machine. This wheel runs with little friction; it is left free to swing out of the needles in case of bunches in the yarn, is easy to adjust, and can handle a wide range of sizes of yarn on the same gauge. It is used principally on gauges from 28 to 40.

Fig. 3 illustrates an evener cast-off wheel in operation. It will be noted that the six blades which are holding up the stitches on the same level is quite a contrast to the old style wheel, where only one blade casts off the stitch at the proper height.

PRODUCTION OF THE FLAT GOODS KNITTER.

BY ERNEST TOMPKINS.

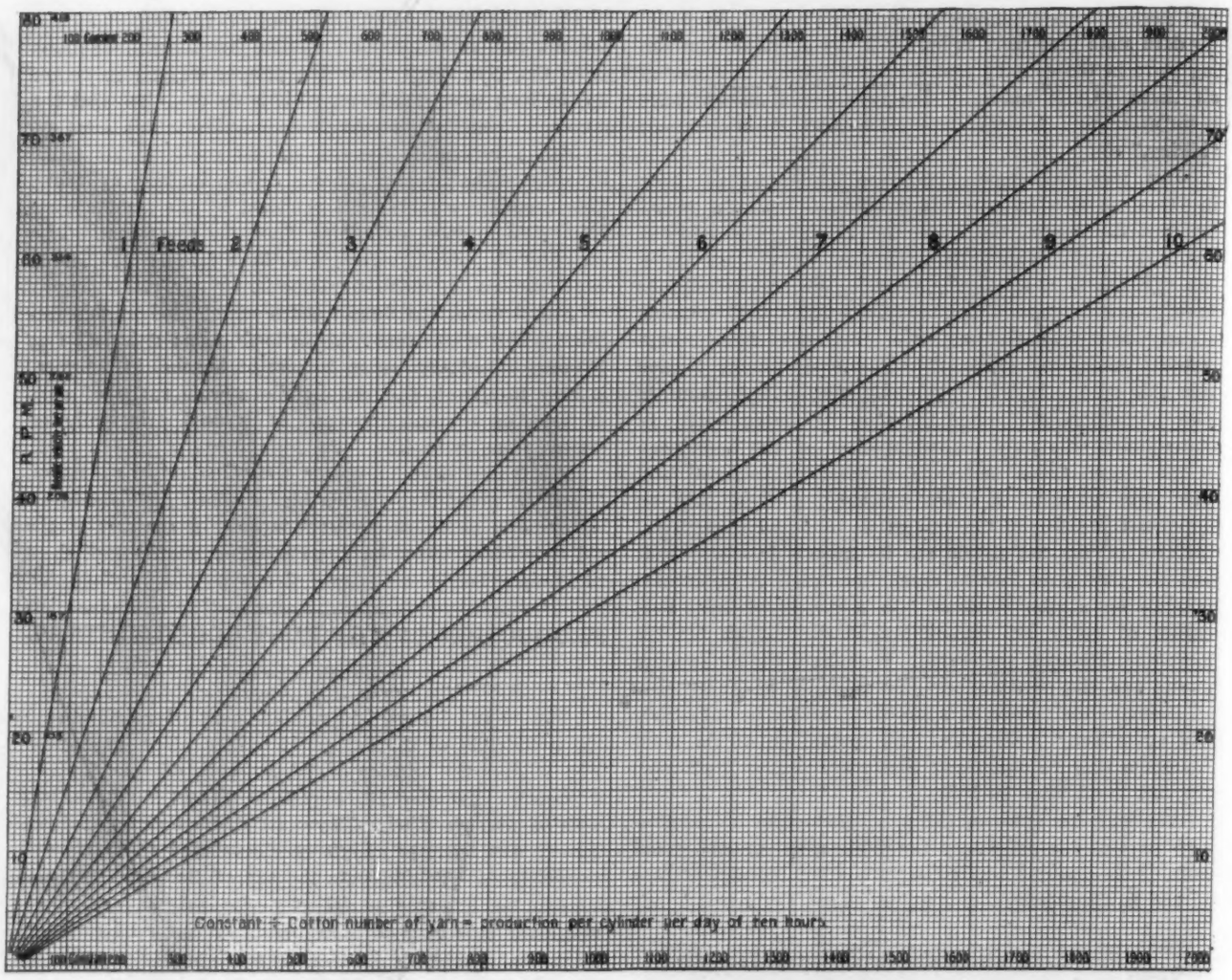
Figs. 4 and 5 show two valuable charts for determining the production of the flat goods knitter. The large chart Fig. 4 gives the number of cotton hanks of yarn knit by a 20-inch cylinder in 10 hours time without stoppage, and with an average stitch. The chart shows a range of from zero to 419 feet per minute needle velocity and from one to ten feeds. To illustrate the use of the chart, we will consider an example as follows: Desired the production under the following circumstances: Diameter of cylinder, 20 inches; number of feeds, 6; revolutions per minute, 60; yarn (cotton) number, 10s.

Start on line 60 in the left-hand column marked R. P. M.; run along the horizontal line to its intersection with the diagonal line 6 representing the number of feeds, and read the number on the vertical line passing through this intersection, namely 1150; this is the number of hanks of yarn knit by the cylinder in ten hours. Divide this 1150 hanks by 10 which is the number of the yarn; this gives a production of 115 pounds. The actual production is less than this, since the machine loses some time in stoppages to take out cloth, replace needles, etc. Say this loss is 10 per cent.; then the 115 pounds production should be decreased by 10 per cent. or 11.5 pounds leaving the net actual production 103.5 pounds.

The production of multiple thread work may be obtained either by finding the equivalent single thread and proceeding with that as above or by finding the production for each thread and combining. Example: Desired the production under the following conditions: Diameter of cylinder, 20 inches; number of feeds, 4; revolutions per minute, 45; yarn (cotton) Nos., 24s and 18s.

First, find in the left hand R. P. M. column line 45; then run along this horizontal line to its intersection with feed line. Then find the vertical line passing through this intersection which is 572. Divide this 572 separately by 24 and 18, and add the quotients. Thus

572 ÷ 24 = 23.8
572 ÷ 18 = 31.7
Total 55.5 Production



Copyright, 1906, by Tompkins Bros. Co. FIG. 4. CHART SHOWING HANK PRODUCTION.

When the problem is stated in terms different from those of the chart, they should be reduced to the latter. Illustration:

PROBLEM AS GIVEN.

Diameter of cylinder, 18 inches.
Number of feeds, 5.
R. P. M., 60.
Yarn (worsted) No., 36s.

PROBLEM REDUCED.

Diameter of cylinder, 20 inches.
Number of feeds, 5.
R. P. M., 54 (60 × 18/20).
Yarn (cotton) No. 24 s (36 × 2/3).
R. P. M. line 54 intersects feed line 5 at banks 860.
860 (hanks) ÷ 24 (cotton number) = 35.8 (pounds production).

The production for backing cloth is obtained by finding as above the production of the webbing—single or double thread, for single or double plush; then adding the proportion of backing, which in the case of cheap fleeces is 100 per cent. In the previous example the face production being 35.8 pounds the total production would be 71.6 pounds.

The stitch on which the chart is based is one found to be a fair average for underwear which is:

$$\text{Number of stitches per one foot yarn} = \begin{cases} 3 \times \text{gage} \\ 4.5 \times \text{needles per inch} \end{cases}$$

Illustration:

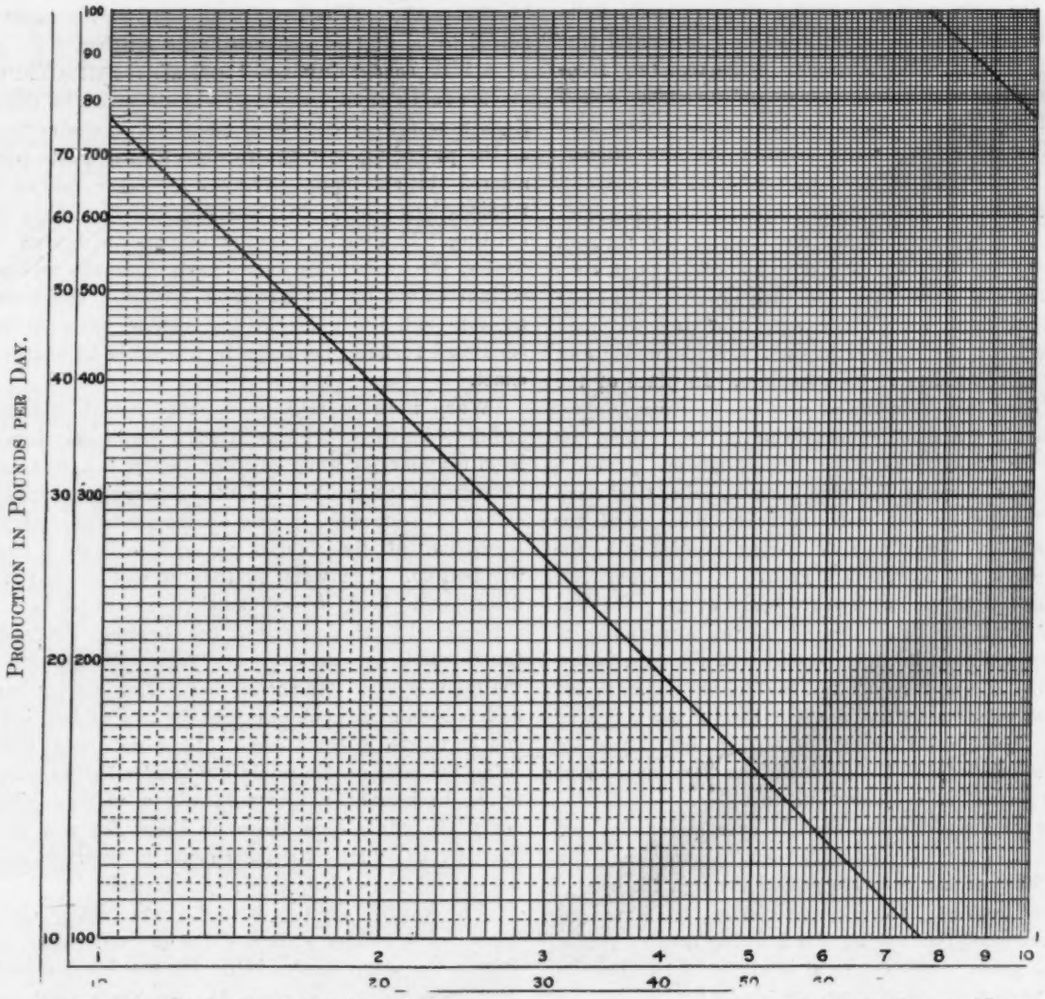
$$\left.\begin{matrix} 30 \text{ gage} \times 3 = \\ 20 \text{ needles per inch} \times 4.5 \end{matrix}\right\} = \begin{matrix} 90 \text{ stitches per} \\ \text{one foot of yarn} \end{matrix}$$

When the stitch is different, reduce the result proportionately. For instance, suppose for a given example the production obtained from the chart is 80 pounds, but the stitch is shorter than the average, say 100 stitches instead of 90. Then the production should be reduced in the proportion of 90 to 100. Thus:

80 × 90/100 = 72 pounds the production for 100 stitches.

SMALL CHART EXPLANATION.

The chart Fig. 5 gives the production in pounds per day of 10 hours of a 20-inch, 4-feed cylinder at 60 revolutions per minute. The range of yarn counts is from 1 to 100 inclusive, cotton count. The yarn counts are at the bottom of the chart, and the pounds production are at the left-hand side. To use the chart, select the vertical line representing the selected yarn number, run up to the intersection with diagonal line and from there to the left where the production in pounds is found.



Copyright, 1906, by Tompkins Bros. Co. YARN COUNTS, COTTON NUMBER.

FIG. 7. CHART SHOWING PRODUCTION IN POUNDS—20-INCH, 4-FEED MACHINE.

Example: What is the production of a 20-inch cylinder, 4 feeds, 60 R. P. M., average stitch, 6s cotton yarn?

At 6 on the (inside) lower scale, run up to the diagonal line and thence to the (inside) left-hand scale where the production is found, being 127 pounds.

Same example but with 9s yarn. Run up from 9 on (inside) lower scale to diagonal line, thence to (inside) left-hand scale where the production is found to be 85 pounds.

Same example as originally but with 20s yarn: Run up from 20 on lower (outside) scale to the diagonal line, thence to the left-hand (outside) scale where the production is found to be 38.3 pounds.

When the example is stated in different terms than those given above, change the result by proportion. For instance, it is desired to find the production for 5 feeds and 50 R. P. M., 20-inch cylinder, 24s cotton yarn. Starting at 24 on the lower (outside) scale and running up to the diagonal thence to the left-hand outside scale gives 32 pounds. But the cylinder ran slower in the ratio 50/60 and the number of feeds was greater in the ratio 5/4. Therefore multiply 32 by both of these ratios and the correct result is obtained. Thus:

$32 \times 50/60 \times 5/4 = 33.3$ pounds.

This chart is also true for the following speeds and feeds:

R. P. M.	FEEDS.
80	3
60	4
48	5
40	6
34.5	7

For stitches different from the average, reduce the results as explained for the other chart. When reading, use corresponding bottom and side lines. That is, if the yarn number is on the inside line the production number is also.

WARP KNITTING.

BY PROF. FRANZ REH, VIENNA TEXTILE SCHOOL.

Warp knitting differs from the ordinary knitting in that the fabric is made not by looping the single thread upon itself, but by the interlooping and interlacing of a number of parallel threads. These parallel threads are called the warp, and the process of interlacing is called warp knitting. In order to understand the construction of warp knitted fabrics, and the meaning of the technical terms, besides being able to distinguish them from others, the better way is to make a close examination of a sample of the goods and the method of forming the loops of which it is composed.

Considered as an abstract proposition, the formation of

the loops is the same in warp knitting as in ordinary knitting. In warp knitting all of the loops in a horizontal row are produced simultaneously, the new loops resulting from carrying the lower or old loops below those newly formed on the needles. This, at least, is what takes place with spring needles, while with latch needles the new stitches are formed by drawing the new loops over the old ones.

The difference between warp and ordinary knitting consists in the manner in which the new stitches are formed. A row of loops on warp knitting does not result from running one thread on the needles and then lowering the sinkers, but results from the distribution, in a predetermined order, of each of the numerous warp threads under and over one or more needles of the machines. In place of the looping we have this distribution in warp knitting.

The elementary and indispensable parts for forming the stitches in warp knitting are: the needles, sinkers, pressers, and a device for carrying the warp threads, called the "warp mechanism." The needles are similar to those used for ordinary knitting. They may be spring needles with the points bent back and moved in a groove by the presser, or latch needles, hinged and with short hooks at the ends. The sinkers used with the two kinds of needles are similar to those used in ordinary knitting, except that the nose is dispensed with. The sinkers are not moved individually, but are displaced simultaneously in order to slip the loops on the needles. The presser consists of a plate that carries the points of the needles into the grooves. The warp mechanism has no counterpart in ordinary knitting.

In order to distribute the threads over and under certain needles, it is necessary to carry them backward and forward; for this purpose they are passed through the eyes of special guide needles. These guide needles, fixed in leads on the carrier bars, face the regular knitting needles in such a way that a guide needle comes at intervals of two knitting needles. The bar serves to carry the guide needles first below and then above the row of knitting needles, and in each of these positions it can be moved sideways so as to distribute the threads as has been explained.

In order to start the fabric it is necessary at first to form a row of loops which take the place of the old loops and which, after being interlaced with the new loops, are formed into stitches. The new row of loops is formed by raising the bar so that the guide eyes carry the threads of the needles upwardly; then by moving the bar sideways be equal to the distance of one needle and lowering it, the threads form loops around the needles. The loops of this first row are considered the old loops and are held by the throats of the sinkers, that is to say, pushed back on the needles as in ordinary knitting and thus isolated from the front part of the needles. Then the new loops are formed, and the bar carrying the guides is moved sideways a distance of one or more needles. As long as the guide eyes remain below the row of knitting needles the threads are distributed under the needles. When, however, the guide bar is raised so that the eye of each needle comes above the knitting needle, then moved sideways for one needle and lowered again, the distribution on the needles is accomplished. The loops thus formed are separated from the old stitches by the nose of the sinkers. These sinkers push the loops backward under the point of the needle and hold the old loops back. The presser then is brought into action and isolates completely the second row of loops by bringing the points of the needles in the grooves. At this moment the old loops are carried around the ends and lowered after being separated by the presser. The new loops hang at the point of the needle to be in turn converted into stitches.

A little consideration will indicate the structure of warp knitted fabrics and will show the distribution of the threads. Each new row of stitches is produced in the same manner as the preceding row, the row previously made being considered the old loops. The use of latch needles involves modifications similar to those found necessary in ordinary knitting. If these self-acting needles are moved independently, the sinkers are unnecessary and are replaced to a certain extent by the knock-off motion. The presser disappears and the guide is first carried forward and then backward forming the loops in a manner as simple as it is exact.

Warp knitting is a much more recent invention than ordinary knitting. It was in 1775 that Crane invented the hand machine for warp knitting. There is a great similarity between these machines and the ordinary hand knitting machines. The frame carrying all the parts necessary for the formation of the fabrics is equipped with treadles at the bottom. The warp is then wound around a wooden drum and held under tension in order to regulate automatically the delivery of the threads. From this beam the threads, passing over a carrier roll, are run through the guide eyes in the carrier bar. This carrier bar, placed as has been explained, opposite the row of knitting needles, can be moved in three ways: (1) A horizontal vibration to bring the ends of the guide eyes under the knitting needles either backward or forward; (2) a vertical vibration to carry the guide eyes above or below the row of knitting needles; (3) finally the movements to the right and left to accomplish the distribution of the threads.

The knitted cloth is wound automatically on a second beam. The carrier rolls and the accompanying parts constitute the warp mechanism. On the hand machine these displacements of the guide bar are made very easily. To this bar is fastened a gear rack connected with a pinion gear which is turned by hand by means of a button or crank, thus moving the gear rack and displacing the bar. On the axis of the crank is mounted a notched disc; each notch corresponds with the space between the two adjoining needles. At each notch a hook connecting with the ratchet holds the rack in place, and it is thus easy to see how far the guide needles have been moved. As the different displacements are co-related with the other movements of the machine, such as the rise and fall of the guide needles and the movement of the sinkers for forming the loops, the automatic operation of the different parts of the machine is very simple. Each carrier bar is pressed by a spring against a plate, which is not circular, but presents raised and lowered places. At each turn of the plate the guide bar is moved backward and forward to distribute the threads. This movement of the plates is effected by the aid of a ratchet wheel and catches, one being used for lowering the bar, another for gauging the loops and the third for raising the mechanism. As in the two former cases the guide eyes remain below the row of knitting needles; the distribution of the threads takes place under the needles. The last displacement, that is, the rise of the bar, takes place when the guide eyes are above the row of knitting needles and the distribution is made over the needles.

Eliminate cotton and the stoppage of spindles and looms would be but a trifle compared to the paralysis that would visit countless other industries.

DYEING, BLEACHING AND FINISHING

THE DEVELOPMENT OF NEW CLASSES OF COLORS FOR COTTON DYEING.

SUBSTANTIVE DYES. DIAZOTIZED COLORS. JANUS COLORS. SULPHUR COLORS. INDANTHRENE COLORS.

(*Contributed exclusively to* COTTON.)

BY STEWART F. CARTER.

It is hard to realize what great advances the art of cotton dyeing has made until we consider the number of distinctly new classes of colors that have been discovered and come into general use since the advent of the earlier aniline dyestuffs and artificial alizarine. During the time in which these new groups of colors have appeared, many excellent and useful additions have been made to the ranks of the Basic colors and those of the so called Alizarine class; these, however, will not be mentioned here, as we are to consider not individual dyestuffs, but new classes of colors.

Out of the ranks of the new products one has to select what is most suitable for his general and special purposes, always watchful for an advance in brightness of shade, fastness, or economy of application, The instructions which makers of dyestuffs give for the applications of their new products are by no means to be considered as the last word on the subject, nor do the makers profess them to be such. They merely indicate the general lines to be followed, the way being then open for such experiments as practical experience may suggest, and the exercise of originality of ideas in totally new methods of application. Many special properties of coloring matters are brought to light in this manner.

SUBSTANTIVE DYES.

The advent of the Substantive or Direct colors for cotton dyeing (so called because they dye direct, without mordanting), opened new fields and made it possible to produce many classes of work with far greater ease and certainty than before. When mercerizing became established, these dyes were found to be particularly adapted for dyeing yarn and goods so treated. In the production of light shades they at once took an important place. It became very desirable, however, to increase the fastness of these dyes, and experiments led to the discovery of the fact that a treatment of the goods after dyeing with copper sulphate increased the resistance to light of some of the colors —more especially certain blues—to a remarkable extent, whilst after treatments with bichrome, bichrome and copper sulphate, or chromium fluoride, helped the fastness to washing but still left much to be desired. Later came treatments with formaldehyde and "solidogen," (a compound formed by acting on ortho or paratoluidine with formaldehyde), which were both found to give rather better results in special cases.

The discovery that certain substantive colors, whose chemical formation was suitable, could, after dyeing, be diazotized and then developed, increased the range of usefulness of this class of colors and gave many shades of very good fastness to washing and cross dyeing, so that there are now navy blues, blacks, reds, bordeaux, pinks, browns, etc., which are in daily use for various purposes where fastness to washing is required. These are what are generally known as "developed colors." The color which is dyed as usual in the case of a substantive or direct color is diazotized after dyeing by treatment with a solution of nitrate of soda and sulphuric or hydrochloric acid, which so modifies the composition of the coloring matter that it can then combine with the developing body (Beta naphtol, phenylamine diamine, resorcine, etc.,) when the goods are passed into its solution. The new color which then forms, or develops, has a shade and fastness to washing which the oringinal dyeing did not possess. It will therefore be seen that the process of diazotization must be carried out perfectly, because, should part of the dye be left undiazotized, such portion will not combine with the developer and therefore the final shade will only be partly fast to soaping, besides being deficient in shade.

A still later method of producing newer and faster shades has originated from the observation that some of the direct colors increase very much in fastness, and in many cases yield fresh shades, when the goods, after dyeing, are treated with a solution of diazotized paranitraniline. This subdivision is usually referred to as "coupled colors" and comprises blacks, browns, dark blues, dark greens, etc., which have their own special sphere of usefulness.

Fastness to light being such an important consideration, all advances in this direction have met with well merited success, both as regards the color manufacturer and dyer. There are, of course, a very large number of direct colors whose fastness to light is sufficiently good for all ordinary purposes. Those whose fastness becomes so very good when treated with copper sulphate are generally more or less modified in tone by the after treatment and are often dulled. The elimination, if possible, of an extra process is always desirable, but until recently there were only a few isolated cases of direct colors having the same very good fastness to light as those which were after-treated with copper salts. There has been quite recently a very marked increase in this direction, so much so, that we now have a sub class of colors, which, without any after treatment, possess a remarkably good fastness to light together with brightness of shade. This very desirable range now comprises yellows, violets, blues, red, bordeaux, orange and the compound shades obtainable by their combinations.

JANUS COLORS.

The Janus colors form a class to themselves, and are so called because they have the double property of dyeing without a mordant similarly to substantive or direct colors, and with tannin mordant in the same manner as with basic dyestuffs; the shades obtained by combination with tannin are the best as regards permanence. In practice the goods are dyed direct and are then given an after treatment with a tannic mordant to produce the required degree of fastness. In this series we have red, yellows, browns, blues, dark greens, greys and black. These dyestuffs are chiefly used for special purposes, more especially for wool and cotton unions and fast shades on silk.

SULPHUR COLORS.

Totally distinct from all the foregoing are the sulphur colors, a series of dyestuffs which has only developed during comparatively recent years, although their discovery dates back to 1874, when the "Sulfures Organiques" of Croissant & Bretonniere appeared, Cachon de Laval and a grey being

the only ones which became of interest and it was not until over twenty years later that the first notable modern sulphur color, (Vidal Black), came on the market. An ever increasing number of these new dyestuffs followed very shortly.

As the processes of manufacturing these colors improved, many of the earlier troubles experienced in their application disappeared. The cases of the dyed goods going tender in stock were traced to the gradual development of acid, and it was found that a good washing was the chief requisite to prevent this tendering. A final treatment in a very dilute solution of sodium acetate was also added as a safeguard. To-day, however, no such troubles are experienced, but care is given to the final washing and the goods are treated as above when it is considered necessary. Then again, the products themselves and their applications are better understood, their manufacture having also been greatly improved.

Some of these colors are given an after treatment with copper sulphate, bichrome, or a mixture of both, to further increase their fastness, but the majority do not call for this. Sulphur colors to-day fill a most important place, especially in dyeing raw cotton and cotton yarn, the blacks being a staple product, while the blues, browns, greens, yellows, etc. are dyed in large quantities. So far, no sulphur red has appeared, but should it come, its use will be very great. The general fastness of sulphur colors is very good, although they are all sensitive to bleaching agents. We find almost daily advances in this important class of colors, which are also taking a prominent place in calico printing, the earlier trouble due to their action on the copper rollers of the printing machine having been overcome and great advances made in the actual methods of printing.

Of great interest to dyers was the advent of the process for producing insoluble azo colors on the fiber. In this instance as in the case of aniline black, the dyer actually produces the coloring matter on the cotton. With the application of the azo colors we have processes which have to be carried on according to definite chemical proportions and most exact conditions. So much were these facts appreciated at the inception of their application that it was feared by some that these conditions would be a serious drawback to the practical, everyday working of the processes. However, the application of this method of dyeing became practically well understood and certain in results, and no where more so than in the United States.

This process consists in preparing the cotton with a solution of sodium beta-naphtolate, drying and then passing through a diazo solution of the color forming body, the temperature being kept down by means of ice. The color is formed on the cotton almost at once, the goods being then soaped and washed. Of these colors, the red from paranitraniline and the garnet from alpha-naphthylamine are the most important. The former being employed for many purposes where turkey red had previously been used, and although not of the same excellent permanence as the latter, its fastness is sufficient for ordinary demands.

The introduction of synthetic indigo was the result of over twenty years patient scientific research and technical experiment, in the course of which apparently unsurmountable barriers were overcome, not only in the successful production of the indigo, but also in bringing it down to a commercial proposition. The passing of the natural indigo marks an epoch as great as the discovery and adoption of artificial alizarin.

INDANTHRENE COLORS.

Quite recently there has been introduced the so called "vat colors" or colors of the indanthrene class. The shades obtained are of excellent fastness and are worthy to rank with genuine turkey red and aniline black. With this class of dyestuffs absolutely fast dark blues, bright blues, greens, olives, violets, helios, yellows, pinks and certain shades of reds, may be produced together with other tones by means of suitable mixtures. Up to the present time, the application of these colors is practically confined to yarns and loose cotton. Certain of these products, however, find successful application in calico printing, their unusual fastness, (even in the laundry), making their use very desirable for shirtings, while in more complicated styles, novel and fast effects can be obtained.

There are already three or four families of this new class, each of which will be found to have more or less characteristics of their own. The introduction of these colors is of especial interest, and undoubtedly points to the advent in the near future of new and important classes of coloring matters, all of which will be noted for excellent fastness and well worthy of the goods which our mills now produce in such perfection and beauty.

CHEMICALS USED IN THE TEXTILE INDUSTRY

USES OF HYDROCHLORIC AND SULPHURIC ACIDS IN THE WOOLEN INDUSTRY. USES IN THE COTTON AND SILK INDUSTRY. MANUFACTURE OF MINERAL ACIDS.

(*Reported exclusively for* COTTON.)

BY DR. FREDERIC DANNERTH, CONSULTING INDUSTRIAL CHEMIST.

LECTURE VI.

THE INORGANIC ACIDS.

The term inorganic is applied in general to all chemical compounds which do not contain carbon. Three important exceptions to this otherwise fixed teminology are the compounds derived from carbonic acid, ferrocyanic acid and ferricyanic acid. The first named compound is very familiar in the form of soda ash, (washing soda, or carbonate of soda) while the two latter compounds find extended application in the textile industry in the form of yellow prussiate and red prussiate of potash. The inorganic acids or mineral acids, as they are sometimes called, in the majority of cases contain oxygen but this rule likewise has its exceptions as we well see when we come to study muriatic acid (hydrochloric acid) which consists entirely of hydrogen and chlorine. Hydrosulphuric acid from which sodium sulphide is derived is another example of an acid containing no oxygen.

In the woolen industry we find many bleachers still "stoving" their wool, an operation in which the moist woolen yarn is hung in a wooden chamber and subjected to the fumes of burning sulphur. For this purpose a definite quantity of roll sulphur or brimstone is placed in a suitable iron pot into which the operator finally throws a red hot iron or horseshoe. If the chamber is large enough the sulphur will burn freely and a gas, (sulphur dioxide) will be formed. When this gas comes in contact with the moisture on the yarn, sulphurous acid is formed, and this in turn acts on the coloring matter of the wool. Sulphurous acid has a great tendency to attract oxygen, and hence quickly removes the oxygen of the yellow coloring matter leaving a colorless substance in the fiber. This removal of the oxygen from the coloring matter is termed a reducing action or

"reduction." Wool which has been bleached by this method will regain its former yellow color when exposed to the oxidizing influence of the air. In this case it again takes up oxygen and thus assumes its original yellow tinge.

The carbonizing of rage or of woolen fabrics depends on the fact that mineral acids, such as sulphuric or hydrochloric, attack the vegetable fibers at high temperatures. After being thus decomposed the remaining powder is removed by suitable dusting machines. When sulphuric acid is used for carbonizing, a bath is prepared having a specific gravity if 1.030 and the goods are impregnated with this solution at a temperature of 158 degrees Fahrenheit.

The dyeing of wool with acid colors is usually carried out in a bath containing sodium sulphate and sulphuric acid. The acid is added for the purpose of liberating the color-acid and for acidifying the bath, as the color-acid is less soluble in water under such conditions. The rapidity with which the dye is absorbed by the wool depends on the amount of acid added. The usual proportion of acid is four pounds for each 100 pounds of wool. The mordanting of wool preparatory to dyeing with alizarin colors is in most cases carried out with three per cent. bichromate of potassium and one-half to one per cent. sulphuric acid (calculated on the weight of the goods.) The material to be mordanted is boiled in this bath for about one hour.

USES OF ACIDS IN THE COTTON INDUSTRY.

In the cotton industry we find large quantities of mineral acids used in the bleach house in connection with the chloride of lime bleach. After leaving the chloride of lime bath the material is passed into a bath of sulphuric acid or hydrochloric acid, the latter is, however, preferable as the calcium chloride which is formed when it is used is quite soluble in water, whereas sulphate of lime (gypsum) is distinctly insoluble. As a result of this the goods bleached with the aid of hydrochloric acid (muriatic acid) have a much softer "feel." In the mercerizing process the yarn or fabric must finally be rinsed, and the excess of caustic soda must be removed or neutralized with the aid of acids. Although many mercerizers use the more expensive but less dangerous acetic acid, there are a goodly number who use the far cheaper sulphuric acid for the neutralizing bath.

In the dyeing of cotton hosiery with alilline black the dyer uses hydrochloric acid for rendering the aniline oil solubule in water. At this point the writer desires to call attention to one of the more daring frauds practiced on the dyer and bleacher. It is in the form of a solution containing from 10 to 20 per cent. of sulphuric acid which is sold at one dollar per 100 pounds, or any price which the bleacher is willing to pay.

In the silk industry sulphuric acid is frequently used in the application of acid dyes, in which case the acid is used for "breaking" or "cracking" the boiled-off liquor. The quantity added should be sufficient to prevent the bath from frothing; it ranges from two to four per cent. The "scrooping" of silk is carried out with acetic acid or in a bath containing five pounds sulphuric acid per 100 pounds of silk. By this treatment the color is brightened, and the silk produces the peculiar rustling sound when crimped in the hand.

The softening of water is frequently carried out by adding small quantities of sulphuric acid to the dyebath, the object being to convert the particularly harmful bicarbonates of lime and magnesia into insoluble sulphates, whereby the precipitation of insoluble color lakes of the dyes is avoided. When using acid dyes this softening operation is combined with the preparation of the dyebath, as the dyestuff itself requires a certain amount of acid before it will be absorbed by the wool fiber. When using basic dyes, great care must be exercised lest too much acid be added, and hence the less harmful acetic acid is usually preferred for these colors. In a few instances we find the dyer preparing his own compounds in the hope of obtaining a more reliable product than could be purchased from unscrupulous dealers. One of the oldest of these is Turkey Red Oil used in the production of that oriental shade on cotton warns and fabrics. In the preparation of this oil a calculated quantity of sulphuric acid is added to castor oil at low temperatures The sulphonated castor oil thus obtained is carefully washed and neutralized. Another of the older preparations still made by some dyers is Indigo Carmine; it is a di-sulpho acid of Indigo obtained by treating the latter substance with concentrated sulphuric acid. The product is used as an acid dye in the coloring of wool and silk. A third product which should be mentioned here is the aniline Salt used in the production of aniline black. This is known to chemists as aniline hydrochloride, and is prepared very readily by treating aniline oil with a calculated quantity of hydrochloric acid. Experience, however, has shown that all such preparations can be made to much better advantages and at less cost by those who make a specialty of their manufacture.

MANUFACTURE OF THE MINERAL ACIDS.

Although the sulphuric acid for pharmaceutical use is still made direct by burning sulphur, the technical product is and has for many years been made from the natural ore known to mineralogists as iron pyrites. This mineral contains iron, sulphur, and small quantities of arsenic which volatilize with the sulphur thereby rendering the acid unfit for pharmaceutical use. The ore is roasted in specially built ovens in a good supply of air; the sulphur dioxide formed by this operation is a gas which can be readily oxidized to sulphur trioxide under suitable conditions. For this purpose the fumes are conducted into a lead chamber where they come in contact with vapors of nitrogen tetroxide and water. The former compound oxidizes the sulphur dioxide to sulphur trioxide (sulphuric acid anhydride) and this in the presence of water forms sulphuric acid. As the acid is now rather dilute it is evaporated in leaden pans and later distilled in platinum retorts. The most common trade product is an acid of 66 degrees Baume (specific gravity of 1.84) containing from 96 to 98 per cent. actual sulphuric acid.

The third and most modern process for the manufacture of sulphuric acid is that known as the "contact method." This is based upon the observation that the conversion of sulphur dioxide ($S O_2$) into sulphur trioxide ($S O_3$) may be hastened and assisted by the "catalytic action" of platinum asbestus. The most important steps in the process are: (1) the preparation of sulphur dioxide in the usual way in a furnace; (2) scrubbing the mixture of gases in order to remove arsenic and any particles of dust which may be present; (3) the formation of sulphur trioxide, which is effected by leading a mixture of sulphur dioxide and air into tubes which have been previously heated to about 750 degrees Fahrenheit; and (4) the sulphur trioxide is combined with water to from sulphuric acid. For this purpose it has been found advantageous to use water containing a high percentage of sulphuric acid, in other words a fairly concentrated acid. This third process is especially well adapted to the manufacture of very concentrated acid.

PRIZE CONTEST LETTERS.

THE NEW PRIZE LETTER CONTEST.

Announcement is made on another page in this issue of a new Prize Letter Contest to be inaugurated by COTTON that will, in the number of prizes offered and the value of them, eclipse anything of a similar nature that has ever been given to textile manufacturers.

There are 39 prizes to be won, the total cash value of which is $390. Everybody with any knowledge of the industry or the life of mill people are eligible for the contest, and this includes both men and women. There were several letters written by women in the previous contest, some of whom were superintendents' wives, and they only missed the prizes owing the small number offered.

The present contest offers so many prizes, that a person's chance of winning is four times greater than in the previous contest. When sending in a letter or letters for the contest, write your name and address plainly at the end of your letter.

COTTON MILL REPAIR ECONOMY.

BY E. M. WILSON.

The repair cost of a cotton mill is one of the most important items connected with the mill. When everything is considered, the actual cost of repairing a part does not at all times cover the total cost. For instance, take a small mill that has it "nip and tuck" to get sufficient slubber roving from a pair of slubbers; it is possible for one of these to go out of commission for a few hours and cause a drag and loss of production through all of the succeeding processes. For this reason it should be the duty of the manager to keep on hand at all times duplicates of the various parts of machinery to avoid any lengthy stoppage. This will prevent stopping one job in the machine shop to take up another.

Where several departments are waiting on work in the shop, then each job should take its turn, unless some portion of the mill is behind or badly crippled; then give the weak spot the preference. But the main idea should be to keep the last machine that turns off the production "humping it" and trust the processes back of it to keep up. The master mechanic is the "man behind the gun" in all cases and should have every reasonable facility at his command to promptly remedy all diseases that come to his shop for treatment.

In addition to being a skilled mechanical worker, the master mechanic should be, and often is, a man of more or less experience through the various departments of the mill. Many a foreman around a mill when in trouble with a machine will often refer it to the master mechanic whether it is his work or not. And again, many an overseer has been helped out of trouble by the master mechanic, that hardly any one else would know about. He is, or should be, the friend of all departments, and should allow no prejudices or ill feelings to interfere with his every effort to keep everything going in good shape. In many cases he is greatly handicapped in his work by a lack of proper facilities; his shop is often placed in some poorly lighted and ventilated place not available for anything else, when he should have a good, light roomy place with space for all supplies that go through his department, and this place should be accessible only to the superintendent and overseers.

This department should also be the supply room with the master mechanic in full control and should be enclosed in front with a counter, over which a required part is given out only when the old part is brought in exchange, with an order from the overseer. Then if the old part can be repaired, or bolts or set screws can be saved, this much will avoid the scrap pile.

Each shop man should be required each evening to make a list of the number of hours worked for each department and the amount of material used. This should be charged daily to each department. All invoices for supplies should be referred to the master mechanic, so he may keep posted as to the cost of each item, and also that the goods may be counted or weighed and checked O. K. on the invoice if such is the case; this will avoid all mistakes of overcharge, shortage or substituted articles which if found can at once be repacked and returned to shipper in case the goods are unavailable for use. The invoice then may be referred to the superintendent for his approval and returned to the office. Each workman should be assigned a portion of bench room with a vise and all other necessary tools, and a certain portion of the machine shop should be under his care to be kept clean and available for instant use at all times.

SANITATION IN TEXTILE MILLS.

BY ROBT. W. BOYS.

Sanitation in textile mills is one of the most important of mill problems and its relation to dividends is also very interesting. There is probably no one who will question the fact that to keep a mill in as perfect a sanitary condition as possible, gives more energy to the help and is an incentive to neatness and cleanliness which develops a method or system that gives better work, better production and more general satisfaction. The lavatories and sinks should be kept clean, well ventilated and disinfected, and the various rooms that are washed and scrubbed should be cleaned with a disinfected water which can be easily made by putting one tablespoonful of disinfectant to each gallon of water. This thoroughly disinfects a room and destroys many causes of disease.

A disinfectant is necesary throughout the entire year but more especially in the summer time. The curtains should be drawn at night on the east and northeast sides of the mill to keep out all of the heat of the sun if possible, and also keep the windows closed in the morning in these sections of the mill as the sun heats up the stone or brick of the mill and when the windows are open the heat enters the room and causes the temperature to rise very rapidly. The windows of the west and southwest part of the mill can be opened for ventilation in the morning and in the east and northeast in the afternoon. This method will keep the rooms in as cool a condition as possible without the use of artificial

means. Of course better conditions can be obtained where artificial humidity and air are installed in a plant, but even when the mill is so equipped it is well to follow the above suggestions.

The spitting habit should be discouraged as much as possible, and where a person is an habitual chewer of tobacco or snuff he should be compelled to provide himself with a cuspidor and keep same cleaned out daily. In the hallways of the mills and in the closets, spit boxes should be provided; they should be filled with sawdust and a little disinfectant added and should be well cared for as occasion demands. All of these matters should be systematically followed up and once the system is thoroughly established there will be no trouble in the help falling into line, and they will be pleased to help as much as possible to protect the reputation of a mill for clean, healthy work rooms.

The moral influence of cleanliness in the mill has a very desirable effect upon the help and has a general tendency to teach them cleanly habits and neatness personally and about their work. There is no one thing more beneficial to the work, especially in the preparatory departments, than keeping the machinery and work clean, for it practically eliminates slubs and bunches in the yarns and keeps out dirt and oil. Cleanliness and good sanitation should certainly be the motto of all well regulated mills.

DRAFTS FOR THREE AND FOUR-PLY CLOTH.

EDITOR COTTON: Will you kindly give me the best drawing-in drafts with their respective harness chains for three and four-ply cloth. The maximum number of harneses to use is 16. SUPT.

COTTON MIXING AND PICKERS.

BY B. W. B.

Cotton mixing is an important operation in the production of a strong and even yarn, and if possible a large mixing for a run should be made for the reason that no two mixings are exactly alike. Compressed bales should have and opportunity to loosen up before the stock is used, and the mixing should be made with this idea in view.

The first bale should be spread over the mixing space on the floor, the second bale being spread all over the first, and so on until the proper amount has been put into the mixing. The mixing should be fed from top to bottom in order to feed a part of each bale, and thus make the mixing a reality. If this system is carried out the numbers will run much evener and there will be less changes of draft necessary.

The next process for consideration is picking. The making of good laps is an important point. A lap should be as firm at one point as at another, and as much foreign matter as possible should be taken out by the pickers, so that the card will receive the cotton in the cleanest possible state, otherwise the card will have more work to perform than it should which will result in trashy carding.

Every effort should be made to avoid producing split laps on the pickers, as they will cause uneven sliver to be produced at the card. The cause of split laps is due to various conditions, such as too much waste in the mixing, too much friction on the horse head, excessive fan speed, or improper division of the air currents. If the air through both cages is equal or about so, it causes the cotton to be matted into two sheets and these are held together very slightly. This trouble may be regulated by the dampers, so that the greater part of the air current is from the top cage. Sometimes the air passages become choked with waste which causes the draft to operate improperly. Keeping all parts clean can not receive too much attention.

In oiling care should be taken not to allow the oil to get on the inside of the casings, where the cotton passes. The inside of the picker should be kept free from dirt, and from cotton hanging to the cages and grid bars.

THE LOOM FIXER AND HIS WORK.

BY PELHAM.

A loom fixer in order to make a success should be well up on weaving. The best fixers are those that have been experienced weavers, and know what troubles the weavers must encounter; they should be men of sound judgment and intelligence, clever with tools, etc. Not every good weaver, however, would make a good fixer, for all do not possess the same qualifications. Loom fixing like weaving takes lots of patience, and some fixers will lose their temper over a difficult job and get so nervous that they can not do anything until they cool off; these kind generally have to call on some other fixer or the boss to aid them.

Others will lose their temper when called back to the same job two or three times, and if they don't speak to the weaver they will snatch and jerk the loom in such a manner as to make themselves ridiculous. Often they will say something to the weavers that will make them angry. Then there begins a feeling of spite or hatred between them which sometimes results in one or both losing their positions. True, there are many careless weavers who don't care if they do aggravate a fixer, but in the majority of cases if the fixer will use kindness and patience with them he can make weavers of them.

There is another kind of fixer who will have some favorities and who will do his best to keep their looms in tip-top shape, while others on his section do not fare so well. But, the most despicable fixer of all is the one who will rush through a job in order to have a few minutes to talk with the boss man and will chat with him at every opportunity and make him believe, if possible, that he is up-to-date in all things; such a man is known as a "bootlick." However, if the overseer knows his business, he will find out who is keeping up his section the best. Of course there are some overseers who have no system and are not close observers, but such overseers are not likely to stay in one place long.

The best fixer or second hand is the man who, first, doesn't forget that he was once a weaver; second, doesn't let a little promotion turn his head; third, doesn't have any chum or favorites, but treats all hands alike with courtesy and is not always finding fault with something on some other fixer's section and telling the overseer; fourth, keeps all nuts and bolts tightened and takes special care to see to this when the loom is empty; he should also see that all oil holes are cleaned out and oiled as often as need be. Great care should be shown in properly oiling machinery. I once worked with a good overseer and this was his weakest point, it mattered not about oiling with him so long as the looms kept running and more than once I have seen red rust in oil holes.

It matters not what kind of clothes a fixer wears so long as they are decent, for a fixer who wears a standing collar while fixing looms won't stay in one place long at a time.

CONE AND TUBE WINDING.

EDITOR COTTON: In answer to the inquiry in the November issue, with reference to an order of 200,000 pounds of 8's yarn to be wound on six-inch parallel tubes, would say that the quantity of yarn generally put on each tube is 2¼ pounds. The 200,000 pounds of yarn would, therefore, require about 88,900 tubes. There is no tare deducted on account of the weight of the tubes, as this weight is practically negligible. The only tare deducted is the weight of the case which usually weighs only 12 pounds. With reference to yarn on cones these are made to weigh, when full, about the same as tubes, that is, 2¼ pounds per cone. There is no deduction for the weight of the paper cones, as the weight in this instance is also negligible.

PURITAN.

MANAGEMENT OF HELP.

BY F. BIRD.

The management of help is becoming a very important factor in textile circles nowadays. To cover the subject thoroughly of the management of help would take a volume. This letter treats of women help, especially. New mills are constantly going up which require a large number of skilled women. There is a general tendency among one class of help to drift from mill to mill, without settling down. They know they are in demand, they read in the papers of the new era of coming prosperity and consequently, they roam about seeking better work and better wages.

By reason of the child labor laws which make the lowest working age fourteen years, the help are better educated than formerly and keep themselves posted through the newspapers, in regard to the times.

If dissatisfied in one place, they know they can get work in another, and they do so very often on slight provocation. These conditions make it hard for an overseer to retain his help; therefore he must adapt himself to present circumstances. The old system of rebuking the help for every little fault, or of discharging them instantly for some disdemeanor, without investigation, is not advisable at this time. And the man who fails to see these signs, will sooner or later become aware of them, and probably with regret.

In order to retain his help as long as possible, keep them satisfied with their work and make them valuable to the mill, an overseer must be thoroughly acquainted with every machine under his supervision. He must have the ability to do the same work that the help do, so that, if complaints are made by the girls in regard to work running bad, he can locate the trouble and remedy it. This method is better than rebuking a hand for a cause which is probably no fault of her's. When a girl is discouraged, he should speak encouragingly to her, locate her difficulties, and if he has spare hands, he should shift one onto her work to straighten her out. In this way the hand appreciates his action, has more confidence in him, and generally works harder. Of course it is desirable and more profitable to weed out objectionable hands and malcontents as soon as possible.

In regard to new and green help, it is very advantageous for the overseer to instruct the new hand personally a little at a time in the different ways in which he desires the work done. This saves much time and annoyance to him, and injured feelings to the hand, when, later on, if he has left the entire instruction of the new girl to others, he discovers her doing a thing incorrectly, according to his idea, and tries to correct her.

Sometimes he finds this correcting busines a very trying and often impossible task. For it is easier to learn to do a thing incorrectly than to relearn to do that thing correctly. Diplomacy and tact must be used in the management of female help, and every overseer meets with little difficulties in handling them, which he must solve in his own way.

ARRANGEMENT FOR CONDITIONING YARNS.

EDITOR COTTON: Answering the inquiry appearing in the November issue regarding the best way in which to make a good conditioning room for 24/1 hosiery yarn for knitting purposes, would say that steam should be used for this purpose. A box should be provided with a false bottom, three inches from the bottom of the box. An ordinary one-half inch pipe is large enough to conduct the steam under the false bottom. The cops or cones are put into the box and a cover of canvas or several layers of light cotton cloth is thrown over it. Just enough steam is turned on to fill the box with vapor. From 15 to 45 minutes are required to set the twist, depending upon the condition of the yarn. Some mills use a large yarn case for the box, putting in a false bottom to keep the yarn out of contact with the water coming from the pipe as condensed steam.

RAYMOND.

MAKING A GOOD LAP.

BY H. C. M.

It is very necessary to make a good lap at the picker if you desire good carding. A good lap is one that is uniform, that is, will weigh the same at any part of a given length, and be free from foreign matter. It is the duty of the carder who is usually in charge of picking to see that these laps are as near perfect as possible. A lap should not vary more than one-half pound each way from the weight desired, and in order to know that they are weighing right, the carder should personally test a few laps each day.

The inside of a picker should be cleaned, at least twice a day, as it can not be kept any too clean. Care should be taken that the rolls are kept smooth. All parts should be kept well oiled, and the machine should be working free with a pliable, well pieced belt running near center of cones.

In setting the beater and grids in the picker for ordinary one inch American cotton, the distance between the beater blade and feedrolls should be 3/16 to 5/16 inch. The grid bars should be set to the beater 1/2 inch at least, while the distance between the bars is usually about 1/2 inch from the edge of the first three bars, while the rest are about 3/8 inch apart. The apron should be kept tight,

so that there will be no slip, and all gears should be set to the proper depth, so that there will be no back-lash.

The air current is a very important consideration in making a good lap, for if it is too weak, too much waste and an uneven lap will be the result; while if it is too strong, the cotton will not be properly cleaned, and split laps will be the result.

THE BEGINNING OF A CARDER'S TROUBLE.

BY J. V. M.

A carder's trouble generally starts first in the selecting of cotton to meet the requirements of counts that are to be spun. The great trouble that a carder has to contend with in this connection is that many mills buy their cotton by samples all together, sent in from commission houses, only buying a lot sufficient to run a very short time. One lot of seventy-five bales may have a staple of 1¼ inches and the grade fair; another set of seventy-five bales may be the same in staple but of a low grade hardly above ordinary, containing neps caused by being ginned in a damp and wet condition. These conditions give the carder his greatest trouble, as he has to make re-adjustments in his picking and carding machines to bring his rovings up to the necessary requirements to meet the conditions of the quality of yarn to be spun.

Another trouble, and one often overlooked by many good men is having incompetent help in the first departments where the stock is started. Put well paid, competent help in these departments and the carder's troubles and the mill's liability to have yarn returned will diminish 50 per cent.

Still another trouble that many carders have to deal with, and which is often beyond their ability to correct, is unequal or excessive drafts. Many mills, not having the proper amount of carding machinery to turn out the production required to supply the succeeding processes, often overcrowd the carding machinery and have to turn out a heavier sliver than should be. This often causes excessive drafts in the later processes, which are required to bring the roving down to its proper hank. This does not only effect the production of the room but it decreases the strength of the yarn which the carder is expected to hold up to its standard. There are hundreds of other troubles caused by a carder's own negligence and incompetent management.

If a carder is familiar with his room, practically and theoretically, the writer believes these are the greatest troubles he will have to contend with. Others are minor and a careful eye and a willing hand can correct them.

MARKET REVIEWS.

MONTHLY REVIEW OF THE COTTON MARKET.

BY H. & B. BEER, NEW ORLEANS.

After having advanced to near the 15 cents level for middling cotton in the local market since our last month's review, due to the world having at last accepted the idea that the indicated crop was about 11,000,000 bales, there appears to be a more conservative tone to the market of late, pending further developments. The last issue of the Census Bureau showed 8,109,737 bales ginned to November 14th compared with 9,595,809 bales to the corresponding date of one year ago and 7,300,665 in 1907. To November 14th of last year 73.3 per cent. of the crop had been ginned, and many are of the opinion that as much as 80 per cent. of the crop was ginned to the same date this year, the more conservative leaning to the belief that at least 75 per cent. of the crop was ginned, which would point to a probable yield of about 11,000,000 bales, linters included. Notwithstanding such conclusions on the part of the conservative element, estimates range all the way from 10,000,000 bales to 12,000,000 bales.

To the 14th inst. Texas had ginned 2,100,970 bales against 2,863,528 bales last year and 1,705,529 bales year before last, but as there is not much promise of a "top" crop this year, it is thought that the production of the Lone Star State will not be more than about 2,500,000 bales compared with 3,819,000 bales last season and 2,221,000 season before last. Although the crop of Texas will probably be about 250,000 larger than in 1907, the yield this year outside of Texas will probably be only about 8,500,000 bales against 10,007,000 last season and 9,351,000 year before last.

Of late there has been a lull in the demand for export, but little business having been booked for December out of New Orleans. This lack of demand may be due to the scarcity of cotton in this section, as any demand of consequence would probably be reflected in an advancing market. The net stock in New Orleans to-day is 100,000 bales less than at this time last year, and as Louisiana and Mississippi are expected to make about 600,000 bales less than last season, the acuteness of the situation from a supply point of view in so far as this market is concerned, can readily be appreciated. The same conditions exist in Texas, the crop having been sold nearly as fast as it was ginned, whilst Oklahoma, Arkansas and the Memphis district are but little better off.

Memphis, unlike other points in the western half of the belt, has more stock than at this time one year ago, but realizing that receipts in the future are to be light, higher prices are being asked for cotton in that market than in any other point in the South, 14⅞ for middling, and only a day or so ago middling there was quoted at 15 cents. Great interest is centered in the forthcoming government crop estimate, and there is one thing certain, its deductions will probably be based upon a revised acreage, smaller than the original 31,918,000 acres estimated last spring, and, perhaps, on one of the lightest yields per acre on record. Under the circumstances we can not but feel that after the government report is out of the way, higher prices for cotton, based upon the law of supply and demand, will be inevitable, as the crop will probably be nearly 20 per cent. smaller than last year's crop, while it will be almost impossible for consumption to be curtailed more than 10 per cent.

It is only during the latter part of the month that

receipts have begun to fall off; the third week's "in sight" having been 160,000 less than last year's movement for the corresponding week, and the fourth week's movement to market was about 200,000 bales less than one year ago when it was 606,000 bales. Up to November 19th there had been marketed of this crop 5,255,116 bales compared with 5,440,082 to even date last year and 3,920,513 bales to same date of year before last. On the basis of a crop of about 11,000,000 bales this year the amount remaining to be marketed would only be about 5,745,000 bales against 8,386,000 balance of last season and 7,652,000 balance of season before last. Therefore, we contend that high prices will be the rule pretty much throughout the remainder of the season, though occasional setbacks, probably serious at times, may be looked for owing to the high level of values and the nervous state in which the market finds itself. We favor buying on all important reactions as we believe that we have yet to see the highest prices of the year.

THE YARN MARKET.

A very irregular and spotty condition has characterized the yarn market for November, and was quite similar to conditions that have existed for some months.

The position of the majority of yarn mills at least is very plain, as every one is aware that they have been running low on cheap cotton and have had to buy fresh supplies at the prevailing prices in order to keep the mills in operation at all. They are therefore placing prices on their products based on the increased cost of raw stock, and as a rule have shown little inclination to make any concessions. There are always some few exceptions, however, where it becomes necessary for one reason or another to turn the yarn over, and the prices realized in these cases are often dictated by the buyer.

The position of the buyer is not as well understood as a great many dealers would desire, and the lack of demand from this source when it is known that they have orders to fill, gives rise to more or less speculation as to the true condition of affairs. Some dealers aver that a number of buyers are in a comfortable position with enough stock on hand to fill their immediate needs while others state that the buyers have pressing needs for the yarns, but are playing a waiting game in the hope that concessions will finally have to be made from the present quoted prices.

There still remains a certain amount of stock yarn in dealers' hands, that was secured at considerably lower prices than the prevailing quotations and the continued sale of this yarn at lower figures has caused most of the irregularity in prices. Many instances could be cited, but one or two transactions will indicate the practice. Near the middle of the month it was reported that a lot of 20/2s skein and 30/2s had been sold at 24 cents and 28 cents, respectively, whereas the nominal quotations asked by spinners were 27 and 30 cents respectively.

Many buyers claim that prices have reached the top, and give that as an excuse for holding off, hoping for a recession. The fact is, however, that if the present price of cotton continues to hold, the yarn prices will have to advance, because as matters stand now, a great many yarn mills are entirely closed down, others are curtailing materially, and scarcely any are doing business in the regular market, all of which facts go to show that the present prices are not satisfactory and even impossible in the majority of cases.

THE KNIT GOODS MARKET.

During the first part of last month, the demand of the hosiery buyer was for spot goods or early delivery. As has been the case for some time, the demand for fleece lined goods has been very brisk, but spot goods in this line were out of the question. However, the demand was not confined to the generally accepted heavy weight line of goods for winter, as staple light weight goods have had a good business for this season of the year. Wool and worsted lines have also had a good demand, due in a great measure to the fact that there was a better supply on hand than in the case of fleeced lined goods.

A good deal of interest was manifested by the buyers in the question of spring deliveries. So many price changes have taken place and other influences have arisen that the purchaser is anxious to know that his contract will be filled completely. Another reason for wanting early delivery is that there is now a good sized demand all the year round for light weight hosiery and underwear, and the goods could be used to some extent for the present season.

As the month wore on, aside from the spot business, there appeared a very fair amount of duplicate orders for spring, which were placed at advanced prices, and were accepted by the buyers as being due to changed conditions. These advances have also had the effect of bringing the subject of spring delivery of previous contracts to the buyer, especially in view of the fact these contracts were made at a lower level of prices than the present range, and also because it is known that yarns were bought very sparingly by some of the mills, even after the contracts for goods had been made, for they hoped to be able to cover the contracts later at lower figures. As a matter of fact, however, yarns have advanced materially since that time, and it would seem that the knit goods buyers were perfectly justifiable in their anxiety over the question of delivery.

Some of the fall lines on seamless goods and full fashioned fleeced goods were opened at advanced prices, and this fact has retarded any rush of business thus far, as the jobber realizes that he will have more or less difficulty in selling the retailer who has the ultimate consumer to deal with. However, it seems practically assured that the advances will be maintained and even seek higher levels, if present conditions in the other markets continue, but these facts evidently require a great deal of consideration by the buyers before their plans materialize into actual contracts.

The bleaching croft is often the place where the weft in the goods get pulled out of position. A finished piece with the weft at an angle of 15 to 17 deg. is not very nice to look at, and goods should not be allowed to get into this state. It can be avoided by carefully watching the running of the cloth through every process. A few minutes each day spent in front of the washing machines in the croft to see if they are running right, attention paid to rollers to see that they are true, and strict attention to deail generally is sure to tell in the final result. It is impossible for a finisher to straighten every piece that comes to his department, and to have to straighten even a few seriously interferes with his output. Of course there are times in all works when a few of the goods will be pulled, but a good manager of any works will see that this is not a general occurrence, for he knows the trouble it causes.

The Textile Mill Situation in the South and New England.

SOUTHERN MILL SITUATION.

(*Special Correspondence.*)

Southern mill men have been deeply interested in the subject of a uniform sales contract to govern the sale of cotton yarns throughout the country. On November 26th, the Sales Note Contract Commission, appointed by the American Cotton Manufacturers' Association, of which President Parker is chairman, met in New York to consider the subject. R. M. Miller, Jr., ex-president of the North Carolina Cotton Manufacturers' Association, speaking of necessity for formulating a uniform sales contract said:

"The object of the sales note is to see that the buyer and seller stand to their contracts. In the past this has not been done in every case and Southern mills have suffered the loss of thousands of dollars because of cancellations and postponement of deliveries on contract. The commission hopes to formulate a contract that is fair to both buyer and seller. The trade needs and demands this. The commission will force both parties to live up to the contract." Numerous mill men of prominence have been interviewed on the subject and all express the conviction that there is pressing need of reforming present methods employed. Mill men characterize the present form of contract as unbusinesslike and disastrous to the manufacturers' interests. Yarn manufacturers demand a uniform sales contract that will offer a remedy for slipshod methods employed at present.

A number of Southern mills have recently held stockholders meetings and declared dividends. Reports submitted show their conditions to be better than might be expected, considering past demoralization of cotton goods trade. Several large new mills have been announced this month. Notable among these is a half-million dollar mill at Lumberton, N. C.

The Duke interests are reported to be interested in the vast power development site near Salisbury, N. C., known as the Whitney development. Rumor has it that the Southern Power Co., a $10,000,000 concern of Charlotte, N. C., in which the Dukes are largely interested, may take over the Whitney property which has been in financial trouble since the panic two years ago. Already $5,000,000 have been expended on the gigantic power generating plant at Whitney, and with the Southern Power Co. behind the project, its consummation will be assured. If this site is taken over and developed it is likely still more cotton mills will be established in that territory, to avail themselves of cheap electric power. Along the line of the Southern Power's development many mills have sprung up, and still others are reported as being under contemplation. The $600,000 plant at Great Falls, is on, or near the site of the Southern Power's large electric plant there.

Considerable interest is attached to the coming meeting in Columbia, S. C. on Feb. 19th of the Southern Textile Association, composed of many prominent mill owners, superintendents, master mechanics and overseers. W. P. Hamrick, vice-president, says that the coming meeting in Columbia will be the most largely attended in the history of the association, and numerous subjects of importance to the trade are to come up for consideration. The program committee is busy arranging an elaborate program for the meeting, and Columbia is planning extensive entertainment of delegates.

One of the most important movements evidenced during the month of November was that of diversification of manufactures. Southern mill men are becoming keenly alert to the necessity of diversification, and during the closing month several of the mills of the South have changed from coarse to fine counts.

The yarn selling agency has received much attention during the past month. Mr. Phelps, of Spray, N. C., who has charge of work of drafting plans for such an agency, has been at work, and says he believes the recommendations to be made at a coming meeting of the North Carolina Cotton Manufacturers' Association will meet with favor by Southern mill men generally. Bankers in Atlanta, New Orleans, Birmingham, Charlotte, and other Southern cities have expressed their desire to co-operate with mill men in making the agency a success.

Mills continue to follow curtailment recommendation, and during November curtailment of production was heavier than during any preceding month of the year. There has been some improvement in the markets, as a result, although conditions are yet far from desirable. That the curtailment movement is universal in its scope is shown by dispatches from England and other countries where mills are still curtailing heavily. After a conference with Lewis W. Parker, president of the American Cotton Manufacturers' Association, C. B. Bryant, secretary of the association, cabled C. W. Macara, Manchester, England, president of the International Federation of Master Cotton Spinners and Manufacturers as follows:

"New York has cable from Liverpool English spinners decided work full time again. Please cable whether report correct." (Signed) BRYANT.

President Macara's cable reply is as follows: "Liverpool cable positively untrue. Believe reports on both sides the Atlantic about countries abandoning short time were invented and circulated by speculators. Short time already worked in England by spinners of American cotton equivalent to five weeks of entire stoppage. A mass meeting will be held Friday (19) at which time confidently expect subsequent ballot will decide to continue present running of 40 hours per week until the end of February, which is equivalent to a further three weeks total stoppage. Short time continues extensively throughout the world, which if carried out on the same scale as in England would mean at least 2,000,000 bales less American cotton would be consumed this season. Continuance of international short time on a large scale will assuredly end the present crisis as in 1904." MACARA.

Eugene Shorniakoff, commissioned by the Russian government to visit America for the purpose of studying cotton production, spent several days in Charlotte going from there to Atlanta, to continue his investigations. Most of his time on this visit to America has been spent in the West where a close study of irrigation methods was made,

with a view to carrying on the work on a large scale in Russia along lines laid down by the Americans. Shorniakoff is a civil engineer and an irrigation expert.

Among other things he said: "There is no doubt that the South is the greatest cotton producing country in the world, and although I am not familiar with your country further South, I do not believe any country in the world can rival it in the production of the raw material. My country is warm enough in some places to grow cotton but without irrigation that is impossible, for the land is too dry. We can not at present grow enough of the staple to even partly supply the demand, and that makes us dependent upon other countries. For eight months I have been studying irrigation methods in Arizona and in the West and Northwest."

NEW ENGLAND MILL SITUATION.

(*Special Correspondence.*)

It is generally admitted that textile conditions in New England have been more favorable the past four weeks than during the month of October when the greatest uncertainty existed. Fabrics and yarns have been advanced to prices that permit of a moderate volume of business for plain goods mills and a fair margin of profit on fine goods. General curtailment has become operative in Massachusetts on account of the new 56-hour law which becomes legally effective January 1, 1910, but is now being put into force by a large number of mills because of the general curtailment sentiment. Furthermore, the action of the Arkwright Club of Boston has influenced mills in the other New England States to take immediate curtailment measures.

Print goods have been advanced ½ cent to a point where there is a slight margin of profit to the manufacturer based upon 14-cent cotton and at present prices there have been some large contracts made for early 1910 deliveries. Now that the Garner printing plants and allied interests have been taken over by Deering, Milliken & Co. of New York, there is so much power vested in this house that new prices on all lines of print goods are expected from this source. This consolidation will materially strengthen the print goods market because they control 44 printing machines, 300,000 spindles and over 7,000 looms, and they will be entirely independent of the Fall River market. There is a very healthy statistical position occupied by converters' stocks and immediate advances are expected.

Staple ginghams are firmly established on a basis of 7 cents for orders taken at-value and there appears to be no serious objection on the part of buyers at placing orders for future business on an at-value basis. There is a small stock of staple ginghams on hand and Southern lines appear to be well taken at full prices. Wash goods are going slow at unsatisfactory prices because it is between seasons. Well-known lines are well taken care of, however, and there is little or no anxiety over this division.

Prevailing high prices for raw cotton have restricted export business on fabrics to a minimum. Stocks are getting low in the Orient, and there have been quite a number of inquiries for prices based upon 14 and 15-cent cotton, so it is expected that December will bring a few year-end orders. England's exports to the Orient have fallen off greatly the past eight weeks which is very encouraging for American manufacturers. There have been a number of good sized orders placed the past month for export to the Philippines, also on tickings and cambrics for the South American trade. The Red Sea trade is very inactive. Exports for the eleven months of this year as compared with the same period during 1908 show a gain for this year of about 40 per cent.

Cotton duck interests report the placing of several large contracts for cotton duck at fair market prices. The Consolidated Cotton Duck Co. has accepted a contract for an order in excess of 40,000 yards of duck for the Navy Department, and 1,000,000 yards of No. 9 duck, special construction for the International Harvester Co., Wellington, Sears & Co., and J. H. Lane Co. have also taken contracts from the Harvester Co. for about the same number of yards of drills and numbered ducks at prices that will show the mills a slight profit. Automobile tops have created a market for drills and light ducks that is very satisfactory and good round prices are being secured for these goods from the automobile trade.

Cotton yarns continue to show slight advances and there has been a very slight improvement noted in the request for weaving yarns at advanced prices. The market as a whole is spotty and without a firm undertone. Braiders are advancing prices on braid and tape from 5 to 10 cents per pound and are unwilling to accept future deliveries at better than prices based upon current quotations for raw cotton plus carrying charges. Samson Cordage Works have advanced their trolley and window cord 10 per cent. and are expecting to make further advances later on.

During the month of October raw cotton was exported to the value of $88,883,350 or a total of $404,621,973 for the ten months of the calendar year. Last year, nearly the same number of bales were exported during the month of October but the value was about $30,000,000 less. But for the export of cotton, this country would be forced to export large quantities of gold at this time when the Bank of England's discount rate is 5 per cent. and commercial loan averaging as high as 6 per cent. in continental countries. Receipts of raw cotton at the port of Boston continue record breaking. The regular steamers are bringing every bale possible while several special chartered vessels are making weekly trips.

There appears to be no labor agitation except in New Bedford where there is some dissatisfaction over the curtailment schedule and in Lowell where petitions are being circulated for longer working days, except on Saturday when labor calls for a shut down at 10 A. M., instead of at noon. Lowell has also adopted the 56-hour schedule.

Among the makers of textile machinery and textile mill supplies there is unprecedented activity. The year about to close will be one of the most prosperous years for machinery and supply makers in the history of the country. There is hardly a manufacturer of textile machinery or equipment that is not operating over time and sold months ahead. Leather belting establishments are sold into the late winter months at advanced prices over one year ago for the better grades, and in many cases are very much behind in orders on deliveries for new mill equipment. The unprecedented high prices for leather slabs and butts indicate advanced prices on all lines of leather products after the first of the year. Loom strapping has been advanced about 10 per cent. this past month and leather lug straps and pickers will be advanced still further after the first of the year.

The Draper Co. is operating full time and is crowded with orders, although the postponement of certain deliveries has given this company some spot goods which are being eagerly snapped up. It is generally understood that unless cotton mill curtailment is extreme, The Draper Co. will declare an extra dividend of 5 per cent. on January 1st. The earnings of this concern have been very large during the past year and it will be entirely consistent to pay an extra at the next quarterly dividend period.

Crompton & Knowles Loom Works are making deliveries on their large loom contracts with the Boston Mfg. Co. and Gosnold Mills of New Bedford, Mass., and will start deliveries on the New Bedford Cotton Mill's order the middle of December. The new Crompton automatic gingham loom was originally made for the York Mfg. Co., of Saco, Me., and because of its high efficiency it has been taken up by other gingham manufacturers, and the output for many months has been taken. Makers of spinning frames spindles and other textile machinery report splendid sales for the past month and are unanimous in the opinion that the year 1910 will be extremely prosperous for the textile and allied industries. It is estimated that 1,500,000 spindles have been added this year in New England or an increase of 10 per cent. in capacity as compared with an average annual increase for the previous years of 1 7/10 per cent.

Textile mill stocks have had a slight recession from highest quotations but as there are very few offerings it is doubtful if any pronounced decline takes place. Androscoggin Mills sold at $208 per share or $75 advance in a little over a year. A sale of Boston Mfg. Co. stock occured last month at $105¼ or an advance of $62 since the last public sale four years ago. New Bedford and Fall River issues hold very steady at slightly under best quotations with ready takers of all offerings. Many of the fine goods mills in Maine are contemplating increased or extra dividends next year, if manufacturing conditions do not become too serious this winter.

NEW MACHINERY AND TRADE NOTES

THE PROCTOR RAW STOCK DRYING MACHINE.

Practically no improvement had been made in the design of drying machines for raw stock during the past fifteen years, until about a year ago when The Philadelphia Textile Machinery Co. brought out its new "Proctor" dryer. The old drying machines were simply a wooden structure with an endless wire screen revolving about wooden drums. The chief trouble that was met with in the old machine was that it was more or less a fire trap. The wooden structure was so built that the steam coils and machinery inside of the enclosure was not easily accessible. The fan bearings were inside the machine in the heat. One of the greatest troubles was in the endless screen which conveyed the stock through the machine.

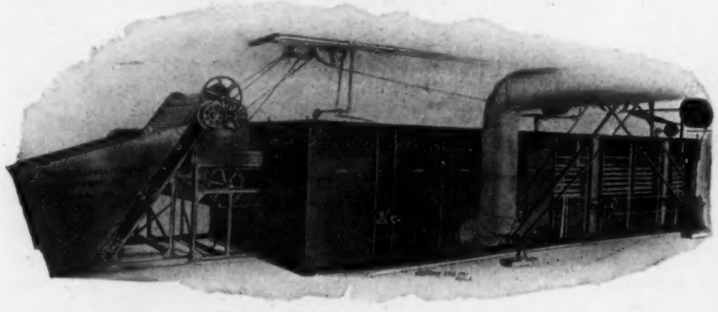


FIG. 1. SIDE VIEW OF PROCTOR DRYER.

This endless wire screen did not always run true, and usually required more or less constant attention to prevent the wire screen from running against the sides of the machine. This tended to wear the wire screen out, and also to cut into the side members of the dryer. Every one of these questions was carefully considered and each has been remedied in the new "Proctor" dryer. The framework of this machine is built of structural steel, and the panels are made upon structural steel frames of two sheets of metal with an asbestos air cell between. All these panels are removable, so that every part of the interior of the dryer may be reached without trouble.

The fans are mounted on large tubes which span clear from one side of the dryer to the other, so that all the fan bearings are located outside of the machine away from the heat. Half of the fan bearings are located on one side of the machine and half are located on the other side, so they may be reached while the dryer is in operation. The latest improved ring oiling bearings may also be used, because the oil does not dry up. The successful use of ring oiling bearings inside where the heat acted upon the oil was previously impracticable.

The introduction of the Interlocking Chain Conveyor obviated the trouble found with the endless apron. A careful study of the illustrations Figs. 1 and 2 will give a pretty good idea of how this Interlocking Chain Conveyor works. Absolutely all the strain is taken on link chains, similar to those used in coal handling machinery. The carrying

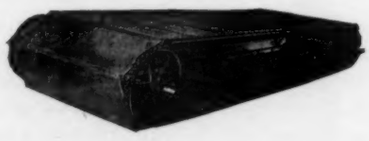


FIG. 2. INTERLOCKING CHAIN CONVEYOR.

portion of the conveyors is made up of interlocking wire sections which turn about the sprocket wheels on hinged joints. There is absolutely no strain on these wire sections, and the conveyor needs no adjustment whatever. The chain guides this through the machine.

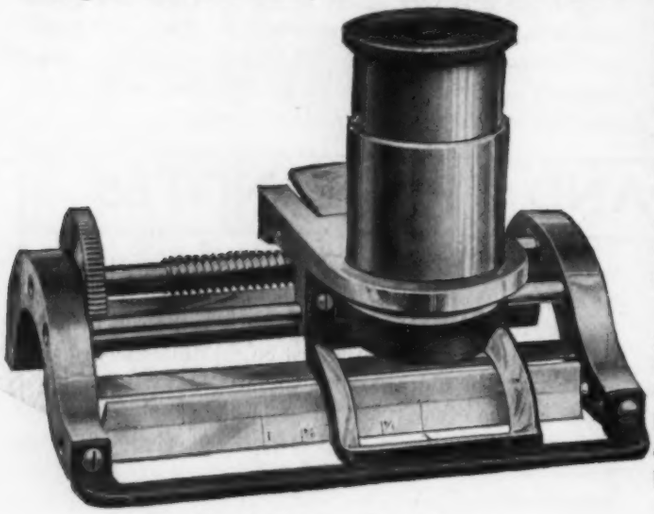
There are over fifty of these machines in operation now, and every one of them is giving satisfaction. Many people who contemplated making repairs to their old wooden dryers have installed these new "Proctor" dryers instead. The saving in the purchase of new aprons for the old dryers alone would pay interest in the investment required to install one of the new "Proctor" machines.

A new illustrated catalogue containing about thirty cuts

has been gotten out describing this new steel dryer with the interlocking chain conveyor. The builder of the machines will mail these catalogues free to any one interested in the purchase of drying machines.

LOWINSON'S TRIPLEX PICK GLASS.

This instrument, shown in the accompanying illustration, is a new design of pick glass for counting threads in textile fabrics to ascertain the construction. The instrument consists of a small frame containing two horizontal bars on which the holder for the lens slides; a three edged bar containing the different scales; and a threaded bar with a



LOWINSON'S TRIPLEX PICK GLASS.

thumb wheel for actuating the holder for the lens by having a grooved portion on the back of said holder in contact with the threaded bar. A pointer is carried by a projecting arm attached to the front of the holder so that said pointer is located close to the cloth and just in front of the scale, at the same time being directly below the lens and guides the eye accurately in counting the threads.

There are three mirrors attached to the barrel of the lens and are so arranged that they throw light on the cloth directly under the lens. One of the special features of this instrument is that when the count is completed the lens and pointer can be moved back to the original position ready for counting again, by simply pressing a lever at the back of the holder, thus disengaging the grooves from the threaded bar, The glass is ready for use again as soon as the pressure of the finger is released when it comes into contact again with the threaded bar.

Another feature is that great stability is afforded the instrument, owing to the fact that the thumb wheel is placed inside the frame work, thus putting the pressure of the hand between two bearing points and not on the outside as with other counting instruments. The fact that the lens holder is mounted on two small bars and also engages the threaded bar prevents the lens from jumping during the operation of counting, and insures accuracy and speed. The triangular bar carrying the scales may be revolved easily when the instrument is raised above the cloth, but by coming in contact with the cloth the bar is held stationary while counting.

The instrument has been adopted by the United States Government at the Port of New York for the examination of imported fabrics and also at the Quartermasters Department at Philadelphia where goods purchased by the Government are examined. The sole selling agent for the United States and Canada of this instrument is Charles Lowinson, 395 Broadway, New York City.

A REVOLVING PORTABLE ELEVATOR.

This elevator, which is shown in practical operation in the accompanying illustration, and is intended for use in warehouses, factories, mills, storehouses, in fact wherever boxes, barrels, bales, cases, etc., are handled. This machine can be operated by one man, and bales or cases weighing up to 1,200 pounds can be raised to any required height up to ten feet. Its use is especially valuable for warehouses or mills where cases or bales are required to be piled practically to the ceiling. It is practically impossible for any amount of manual labor working on one case to perform the work as quickly and pile the cases as high as this machine will.

The machine is built entirely of steel and iron, the only part of wood being the crank handle. The platform revolves on the base and is ball bearing. The hoisting platform, has a part of the framework to slide in the vertical beams and is operated by means of a steel rope running up over a pulley and being connected to a barrel near the bottom of the machine which is rotated through gears by

REVOLVING PORTABLE ELEVATOR IN OPERATION.

the handle. The hoisting platform is equipped with four large rollers, so that the object hoisted may be easily removed when it is raised to the required distance. The machine will not tip over, even when the load is at the top of the lift. A brake arrangement is provided, and also means for disengaging the gears, so that the hoisting platform may be lowered, while being constantly under the control of the brake. A handsome catalog giving a complete description of the different styles of the portable elevators made by this company may be obtained by addressing the New York Portable Elevator Co., Jersey City, N. J.

AN IMPROVED SIZING KETTLE.

The sizing kettle shown in the accompanying illustration is made by John E. Smith's Sons Co., Buffalo, N. Y., and beside being used for mixing size, it may be used by bleachers, dyers, finishers, and cotton printers for mixing coloring and finishing compounds.

The kettle is made of steel, being jacketed for 2-inch steam space for boiling the size. Steam pressure at 100 pounds can be used with safety. The mixing arrangement consists of a vertical shaft, centrally located in the kettle.

SMITH'S IMPROVED SIZE MIXER.

On this central shaft is located a pair of arms, shown extending horizontally to the left hand in the illustration, and holding a vertical agitator shaft which is revolved on its own axis by means of the gears shown, and also revolved around the central shaft by means of its connection with said shaft. Located also on the central shaft are three horizontal arms, shown extending to the right hand in the illustration, and carrying a blade which scrapes close to the wall of the kettle.

The sizing is thus thoroughly mixed, thereby avoiding lumps in the size and producing a uniform and consistent mixture.

The cost of these kettles is about one-half that of copper kettles.

THE DRAPER CO., Hopedale, Mass. The October issue of "Cotton Chats" contains the report of the committee appointed to prepare suitable resolutions upon the death of the late Joseph B. Bancroft, president of the Draper Company. A short paper on Mr. Bancroft's life and his connection with the Draper Co. has been prepared.

A letter from Mr. C. D. Robinson, agent of the Crompton Co., Crompton, R. I., relative to Mirror spinning rings is also published, in which Mr. Robinson states that they start equally as well in regard to travelers coming off and ends breaking as sample No. 1 flange two-inch rings that were sent some weeks previously. Two characteristic scenes of the Ninth Annual Field Day are also given on the back page.

THE WHITIN MACHINE WORKS, Whitinsville, Mass., have purchased the entire plant of the Providence Machine Co., Providence, R. I., including all patterns and patent rights, etc. The output of the Providence Machine Co., was roving machinery, which will hereafter be manufactured by the Whitin Co., at the Whitinsville plant. This purchase by the Whitin Machine Works gives them practically a complete line of cotton machinery, and represents one of the most important changes that has taken place among textile machinery builders in a long time.

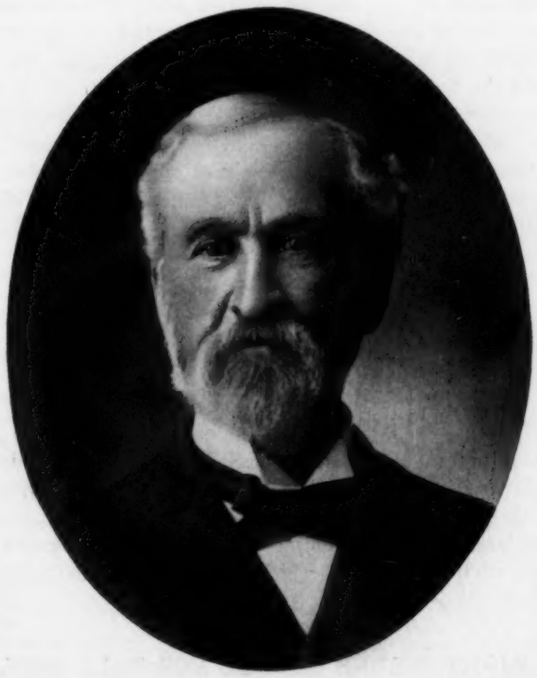
JOHN W. FRIES, New York City, manufacturer of Hygrosso Humidifiers, is now represented in the South by S. H. Haskell.

GEO. D. MAYO MACHINE CO., Laconia, N. H. F. W. Richardson who is representing this well known knitting machine concern in the South, visited the offices of COTTON in November, and expressed great satisfaction at the amount of new business in this section.

THE G. M. PARKS CO., Fitchburg, Mass., sole agent for the well known Turbo-Humidifier is represented in the South by B. S. Cottrell with offices at Charlotte, N. C. Mr. Cottrell while in Atlanta during November found time to pay COTTON'S offices a visit, and stated that Turbo-Humidifiers were finding much favor in the South.

HENDRICKS H. WHITMAN, of Boston, has taken charge of the office and sales rooms of William Whitman & Co., Royal Insurance Building, Chicago, Ill. Mr. Whitman is a graduate of Harvard University, Class of 1906. After his graduation he spent some time in a banking office; since then he has been in the offices of William Whitman & Co., Boston, and has received training in the mills with which that firm is identified.

DARY RING TRAVELLER CO., Taunton, Mass., has been making spinning ring travelers for over eleven years, and as Marcus A. Dary, the proprietor said "The value of ring travelers is measured by what they do and not by what they cost." This company states that it has been demonstrated



MARCUS A. DARY.

by first class mills from an exhausted experiment that the Dary traveler will produce more and smoother yarn with less waste, than travelers made by the old process. These travelers are made with round point or square point steel and composition.

AS A RELIABLE SIZING for warps the Arabol Mfg. Co., 100 William St., New York, recommend their "Sizeoleum;" it does not call for the addition of tallow. Southern manufacturers, in particular, who have used it, are greatly pleased with it. It gives excellent results on warps for gray goods of the export grade and for converters' goods. Used with starch (Arabol standard sizing starch) it works splendidly as a sizing for warps for sheetings, print cloths, shirting, duck and similar goods.

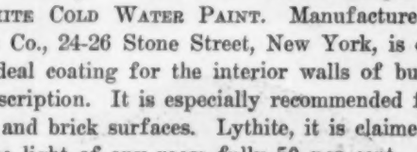
THE RELIABLE TIE CO., Chadwick, N. Y., manufactures an article shown in the accompanying illustration for tieing bundles of all kinds—clothing, underwear, knit goods, etc. In order to tie a bundle it is only necessary to place a cord

THE TIE, AS USED.

around the bundle and catch on the tie hook, and draw as tight as desired. To untie the bundle, the back of the tie is grasped and drawn away from the bundle, the tie instantly releasing the cord.

THE DISC GIN, made by the United Cotton Gin Co., Boston, Mass., has been running at the Putney Ginnery, Putney, Ga., for the past month. It has been seen in operation by a large number of ginners who have been much pleased with its working. Several orders have been placed.

LYTHITE COLD WATER PAINT. Manufactured by The Reddeno Co., 24-26 Stone Street, New York, is claimed to be the ideal coating for the interior walls of buildings of every description. It is especially recommended for use on concrete and brick surfaces. Lythite, it is claimed, will increase the light of any room fully 50 per cent. It is said to be the whitest white made, and should not be confounded with whitewash, kalsomine and other cheap coatings. Lythite is guaranteed not to crack, rub or peel. It gives an extremely hard, sanitary surface, and retains its dense whiteness. It also has many other uses, being made for exterior



purposes as well, and is guaranteed to be both fire and weatherproof. It is also produced in twenty-four handsome shades. Mill owners and others interested should write to the manufacturers of this product, who will gladly furnish facts and good sized samples free of charge to prove the merit of their material, which has back of it ten years of unquestioned reputation.

EIGHT WEEKS COURSE FOR MILL MEN.

Beginning January 10, 1910, the Textile Department of the A. & M. College at West Raleigh, N. C., will offer an eight weeks course for mill men. This will be a thoroughly practical course in every particular. It is one of the best opportunities a mill man can have to advance his knowledge of mill work. The work offered will be in carding, spinning, weaving and designing, and a student can take any or all these subjects in the given time. To the mill man acquainted with mill work this course offers unlimited possibilities.

The cost for the eight weeks, which will include board, room rent, and other expenses, will be thirty dollars. A pamphlet illustrating the Textile Department will be sent free upon application to Thomas Nelson, Director, West Raleigh, N. C.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

Arkansas.

MORRILLTON. Scanlon Brothers, manufacturers of woolens will, according to reports, incorporate and enlarge their woolen mill.

SAN BERNARDINO. Imperial Valley interests plan the establishment of a factory in this place, and the matter has been placed before the Chamber of Commerce. Valley ranchers are preparing to put a area in cotton and the idea is to have the factory completed in time to use the crop.

Connecticut.

HARTFORD. Samuel Courtland & Co. of London, England, are to establish an artificial silk plant in America, and this city is endeavoring to have the company locate here. The proposed plant will give employment to 1,000 hands during the first year, when a duplicate plant will be erected, which will give employment to 2,500 operatives.

NEW BRITAIN. The American Hosiery Co. is preparing to erect an addition to its plant to take the place of old buildings of the factory which are being torn down. The details of the plans of the new building have not been given out.

NORWICH. The United States Finishing Co., at the recent annual meeting of stockholders authorized the capital stock to be increased to six million dollars, three million dollars preferred and three million common, of which one million, five hundred thousand dollars is now outstanding.

SOUTH MANCHESTER. The Trotter Mill which has been acquired by the Cheney Brothers Co., manufacturers of silk products, and will be equipped with 98 looms.

TAFTVILLE. The Ponemah Mills Co. is building a dam 300 feet long and 34 feet high to hold back 50,000,000 gallons of water. The dam will be made of stone with a concrete core. The addition to the weave shed which will be 133 feet is about half completed; it will have a saw tooth roof.

Delaware.

DOVER. The Keystone Linen Mills Co. has been incorporated with a capital stock of $125,000 by C. R. De Montiord, Ardmore, Pa.; C. S. Metcalf, Norristown, Pa., and S. L. Brown, Philedelphia, Pa., for the purpose of flax planting and spinning.

WILMINGTON. Rising Sun Knitting Mills Co. has been granted a charter to manufacture cotton and woolen goods; the capital stock to be $100,000.

Georgia.

AMERICUS. Reports state that Mr. Lanier is engaged in an effort to establish a big cotton mill in this city.

CANTON. The Canton Cotton Mill's new addition is progressing rapidly. The building is 127x300 ft., in which will be installed 10,000 spindles, 274 looms, 54 cards, the contracts for which were awarded as follows: Whitin Machine Works, Whitinsville, Mass., to furnish cards and drawings, spindles and looms; the Woonsocket Machine Co., Woonsocket, R. I., to furnish the fly frames. The cost of enlargement and equipment to be $250,000. (Woonsocket Machine Co. now owned by Whitin Machine Works).

DOUGLASVILLE. J. T. Duncan who is to establish a hosiery knitting mill in this city has obtained a suitable building and power plant, and will proceed to secure the necessary machinery.

MANCHESTER. Manchester Cotton Mill's building is progressing rapidly. The plant is expected to be in operation by February, 1910. The new building will be three stories high, 100x475 ft. The equipment will include 25,000 spindles and 475 looms for the production of drills, and specialty fabrics. The Saco and Pettee Machine Works, Newton Upper Falls, Mass., will furnish the preparatory machinery; the Draper Co., Hopedale, Mass., will install looms, and the G. M. Parks Co., Fitchburg, Mass., will furnish Turbo-humidifiers. The mill is capitalized at $500,000 and will employ about 400 operatives. F. E. Calfoway, LaGrange, Ga., Pres.

TURNERSVILLE. J. E. Ellis is reported to be planning the establishment of a knitting mill. Correspondence is invited with manufacturers of knitting machinery.

Indiana.

FORT WAYNE. Wayne Knitting Mills have put their 600-horse-power engine, and 700-horse-power dynamo into operation, which are working satisfactorily. The engine was built by Filer & Stowel, Milwaukee, Wis. and the dynamo by the Fort Wayne Electric Works.

Maine.

AUGUSTA. Worumbo Manufacturing Co. are building a large store-house, also a machine shop and electric power plant for furnishing their own power and light.

LEWISTON. A Textile School for this city was the subject for discussion at a meeting of citizens, and a committee was appointed to consider the organization, and recommend a set of officers.

PORTLAND. Peerless Knitting Mills Co. has been incorporated with a capital stock of $100,000 for the manufacture of woolen, worsted and cotton goods. The officers are: President L. L. Hight; treasurer S. M. Kirkpatrick.

Massachusetts.

ASHBURNHAM. The Ashburnham Mills Corporation has acquired the plant of the Ashburnham Cotton Mills and the Ashburnham reservoir which supplies the water-power for the mills. The purchase price, it is reported, was about $50,000; the plant will make cotton yarns under a new process.

FALL RIVER. M. C. D. Borden has purchased all of the property lying between Central and Pocasset Streets, and extending from the Pocasset Mfg. Co's., main plant to the Fall River Manufactory. The plot comprises about four acres, with valuable water rights and a number of substantial brick and stone buildings. M. C. D. Borden as the owner of the American Printing Co., and the Fall River Iron Works Co., becomes the owner of all of the property on the extreme west of the main plant of the Pocasset Mfg. Co., with the exception of the Fall River Manufactory.

HOLYOKE. Farr Alpaca Co. has contracted for the placing of a new turbine to cost about $100,000 in No. 2 Mill.

LOWELL. The Merrimac Mfg. Co. has obtained permit to build two stories on to the one-story dye house 80x120 ft. at an estimated cost of $25,000, and a new building adjoining the dye house 147x165 ft., three stories high to cost $50,000.

MALPOLE. The Lewis Mfg. Co. which now has a new cotton mill building in course of erection, has changed its plans so that the building will be 130x60 ft. and two stories high, to be used for finishing. Other buildings are to be erected to take the place of some of the old buildings of the plant.

NEW BEDFORD. Apponegansett Mill has awarded contract for the building to J. J. Pri..erville of South Framington. James E. Stanton, Jr., treas.

NEW BEDFORD. Hodges Finishing Co. has been incorporated with a capital stock of $100,000. The company will bleach dye, mercerize and do general finishing work on cotton piece goods. Charles O. Bradford, New Bedford, pres.

WATERTOWN. Aetna Mills are adding 50 new high-speed looms to their equipment, which will probably be in operation by January 1, 1910. A complete electrification is being effected, each loom having its own motor.

Mississippi.

GREENVILLE. E. P. Brannon is reported to be interested in the establishment of a hosiery mill.

Missouri.

ST. LOUIS. Sigmund Baer, A. D. Brown, H. W. Peters, E. W. Brown, Eliah Mitchell, and G. R. Branches are interested in the establishment of a cotton mill in this city, and plan the organization of a company capitalized at $500,000.

New Hampshire.

MANCHESTER. Coolidge Mill in McGregorsville, one of the mills of the Amoskeag corporation has been completed and the machinery is now being installed. Operation will not be begun until early spring. The mill is 100x700 ft., with two wings each 100x200 ft. It is estimated that 3,000 operatives will be employed.

New York.

HOOSICK FALLS. The Superior Knitting Co., will, according to report, build a four-story addition 40x50 ft.

NEW YORK. Deering, Milliken & Co. have formed a syndicate, which has acquired a controlling interest in the Rockland and Dutchess Print Works owned by Garner & Co., of New York. The Print Works will hereafter be under the management of Deering, Milliken & Co., who have been appointed sole selling agents.

SCHENECTADY. Alpha Knitting Co. has been sold to the American Locomotive Co., which already owns all of the property adjacent to the mills. The Alpha Co. will give up possession about March 1, 1910. Two hundred and fifty hands are employed in the mill making first-class all wool underwear.

UTICA. Kendall Knitting Co. is reported planning the erection of a four-story mill 50x154 ft.

UTICA. Nugent Hosiery Co. has been formed by parties formerly connected with the Hamilton Hosiery Mills of Hamilton, N. J.

UTICA. Utica Fine Yarn Co. has awarded contract to Geo. W. Shippey of Utica, for the erection of a three-story 124x104 ft. building with a three-story wing 30x72 ft. Company was reported last month as having been incorporated with a capital stock of $225,000, by W. B. Foster, W. H. Roberts and G. L. Wood.

UTICA. The Utica Willowvale Bleachery will increase its capital stock from $375,000 to $500,000.

North Carolina.

ASHEVILLE. The Elk Mountain Cotton Mill. The Court has confirmed the sale of this mill to J. Martin of Hickory, N. C., the bid being $144,000. It is understood that he will organize a company to operate the plant.

BESSEMER CITY. The Page Mfg. Co. is the new name of the old Slater Mfg. Co. The new concern with the present equipment of 15,000 spindles, 400 looms, has ordered 400 additional looms for the production of madras.

BURLINGTON. A hosiery mill company has been incorporated with a capital stock of $50,000 to establish a mill. The incorporators are: E. H. Murray, J. W. Boland and Ella L. Murray.

CANTON. J. D. Carpenter of Newton, N. C., will organize a company with a capital stock of $50,000 to build a cotton mill.

CONCORD. Kerr Bleaching and Finishing Works have increased their capital stock from $25,000 to $45,000, the object of which was to cover the cost of rebuilding the part of the works which was damaged by fire.

CREEDMOOR. Standard Hosiery Mill Co. will, according to report, increase its capacity by adding machinery to its present equipment of knitting machines.

GASTONIA. The Flint Mfg. Co. is having installed 2,000 additional spindles.

HICKORY. Asheville Quilt Mills have been incorporated with a stock of $150,000, by J. A. Martin of Hickory, J. H. & J. G. Merrimon of Asheville, N. C.

HIGH POINT. John H. Tate is completing plans for the establishment of a hosiery knitting mill at this place.

JAMESTOWN. The Oakdale Cotton Mills will, it is reported, erect a two-story 100x200 ft. brick building as an addition to its plant.

LEXINGTON. The Southern Power Co. is building a $25,000 sub-station in this city and will furnish power to the Dacotah Cotton Mill, Wennonah Mills, and Nokomis Mills.

LINCOLNTON. The Saxony Spinning Co. The erection of the buildings for this plant is progressing rapidly. The main building will be 75x316 ft. with engine and boiler rooms adjoining. A cotton warehouse will be 40x100 ft., and there will be 30 cottages for operatives. The initial equipment will be 5,700 spindles with plans for increasing this number to 10,000. Steam-power will be used. Edgar Love, Pres., and James Lee Love, Treas.

RALEIGH. Glenwood Knitting Mills which suffered a loss to its plant to the extent of $2,500 due to fire ,will rebuild.

RALEIGH. The Martin Hosiery Mills have re-arranged their plant in order to accommodate a hundred more knitting machines on the first floor.

RUTHERFORDTON. Cleghorn Mills has been incorporated with a capital stock of $200,000 for the erection of a cotton mill. The company has been organized as follows: Pres. S. B. Cannon, Henrietta, N. C.; vice-pres. J. R. Gilliam of Lynchburg, Va.; secretary John C. Mills. The directors are: S. B. Cannon, H. M. Wade, Charlotte, N. C.; R. P. Scruggs, Caroleen, N. C.; John C. Mills, and M. O. Dickerson of Rutherfordton. The company acquires the Levi Cotton Mills.

SALISBURY. D. L. Arey has secured a site for a cotton mill, and will begin the erection at an early date; the cost to be $50,000.

THOMASVILLE. The Amazon Cotton Mills Co. has awarded contract for the construction of a cotton mill building and reservoir to Thompson Brothers of Charlotte ,N. C. Chas. G. Hill of Winston, N. C., Treas.

TRYON. The Peerless Hosiery Co. has been incorporated by F. T. Bacon, B. L. Ballinger, and H. M. Wilcox with a capital stock of $100,000.

WILSON. R. E. Townsend, according to reports, is interested in a proposition to build a cotton mill.

Ohio.

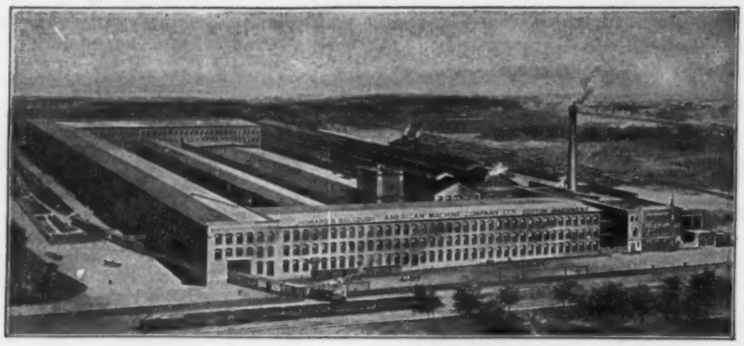
COLUMBUS. The State Penitentiary will establish a knitting mill in the old cigar factory for the purpose of manufacturing

C. E. RILEY, Treas.
Boston Office
65 Franklin St.

HOWARD & BULLOUGH
American Machine Company, Ltd.
PAWTUCKET, R. I.

Southern Offices
814-816 Empire Bldg.,
Atlanta, Ga.

COTTON MACHINERY



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hosiery for the State institutions. It will be operated by prison labor. The necessary machinery will be installed by January 15, 1910.

MENTOR. Mentor Knitting Mills Co. Work is started on a large addition 50x100 ft. to this plant, to be used as a dining hall, cook and rest room for its operatives. The company employs 300 operatives.

TOLEDO. The Dauphin Hosiery Co. has been incorporated by Chas. T. Lawson and others with a capital stock of $10,000.

Oklahoma.

CHICKASHA. The Oklahoma Cotton Mills Co. is proceeding rapidly with the erection of its knitting mill. The building will be 68x180 ft., three stories high and will be equipped for manfacturing knit underwear. The company is capitalized at $150,000, the officers being pres. R. K. Wooten, vice-pres. L. M. Potts, sec. J. R. Abercrombie, and treas. J. D. Chastain.

MUSKOGEE. S. X. Swimme of the Phoenix Publishing Co., is planning the organization of a company to build a cotton mill, and desires some experienced cotton manufacturer to become associated with him in the enterprise. Mr. Swimme has selected a location for the mills where natural gas can be obtained for fuel. Besides this, water-power and a large supply of raw cotton can be obtained at lowest prices. He also has offers of free power for ten years, and cash and land amounting to $100,000.

Pennsylvania.

EDDYSTONE. Eddystone Print Works are erecting a one-story brick building 40x80 ft. between the Bleach house and Eddystone Ave. The building will probably be used for storing drugs.

HARRISBURG. Moorehead Knitting Co. has filed application for a charter, the incorporators being Ed. S. Herman, A. G. Knisely, and Robt. W. Moorehead. Capital stock to be $50,000; men's hosiery will be manufactured. Mill will be equipped with 40 knitting machines for the production of 250 doz. pairs of hosiery per day.

NEW CUMBERLAND. The Pennsylvania Underwear Co. will install five additional knitting machines, to their present equipment in the near future. Its capacity then will be 300 dozen of ladies knit vests per day.

POTTSTOWN. The Gold Seal Knitting Co. has been incorporated by J. D. Clemons with a capital stock of $10,000.

READING. The power company, which is to supply power to the Narrow Fabric Co., and the Berkshire Knitting Mills has recently installed a 300-horse-power boiler. The 125-foot stack of this plant is about completed.

SCRANTON. The Standard Knitting Co. has been incorporated by Adolph Hasner, Christopher Gominger, Carl Lowe, and Frederick Glatz, for manufacture of all kinds of wearing apparel, woolen and other fabrics. The capital stock $100,000.

SHOEMAKERSVILLE. Harry V. and Edward Burkey contemplate entering the knitting business, and expect to operate a large plant very shortly.

Rhode Island.

PAWTUCKET. Pawtucket Dyeing and Bleaching Co. will build a new plant to be located opposite the present plant, at a cost of $200,000.

OLNEYVILLE. The Earnscliffe Woolen Mills which controlled four other factories in Rhode Island, Massachusetts and Maine were petitioned into bankruptcy on November 4th. The capital stock of the Earnscliffe Mills is $750,000; the other liabilities amounting to more than $200,000. The assets normally are rated at about $500,000.

WOONSOCKET. Charles Harding of Boston, Mass., it is reported, desires to erect a worsted yarn mill of from 8,000 to 10,000 spindles on the Cr Spring land opposite the Scotia Mills and across the Blackst River.

WOONSOCKET. ı de Island Dyeing and Finishing Corporation has been sold, together with the real estate and two hundred and seventy-five lots of machinery.

South Carolina.

ANDERSON. The Anderson Cotton Mill will install carding and spinning machinery in its No. 1 mill in order to put the same in first-cass condition. The cost of this equipment will be about $50,000. It is expected that 2,000 spindles will be added to the equipment.

ANDERSON. Orr Cotton Mills, in changing one of their mills over to fine goods, will add 8 intermediates, 14-ply frames and double creel the spinning.

COLUMBIA. Alice Cotton Mills Co. has been incorporated with a capital stock of $350,000 to establish press cloth mill. W. A. Haygood, and E. H. Shanklin

COLUMBIA. The Parker Mfg. Co. has been incorporated with a capital stock of $350,000 t oestablish press cloth mill. A. F. Parker, pres; F. B. Parker, vice-pres., sec. and gen. mgr.

GREENVILLE. Union Bleaching and Finishing Co. will increase its capacity 50 per cent. by installing additional machinery.

GREENWOOD. The Greenwood Cotton Mills, according to reports, will install additional machinery in mill No. 2. The present equipment is 30,000 ring spindles and 700 broad looms.